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AND

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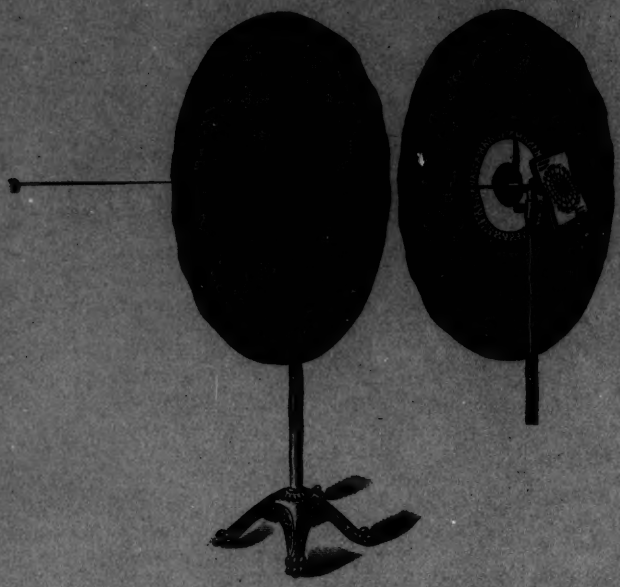

A NEW SCOTOMETER.

By COL. R. H. ELLIOT, I.M.S.

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ILLUSTRATIONS

ON THE

FORMATION OF CLEAR SPACES IN CORNEAL NEBULAE

BY

W. T. HOLMES SPICER.

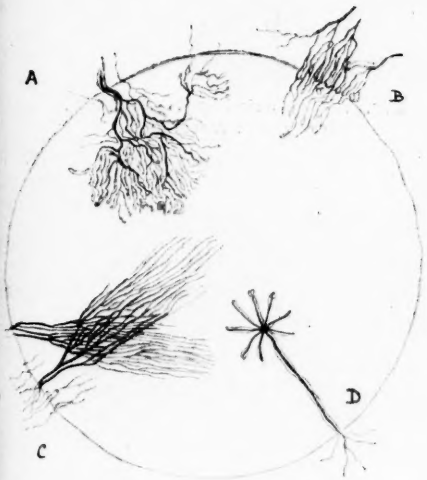

FIG. 1. Types of vessels in the cornea.
A. Arborescent type. B. Terminal loop type.
C. Brush or besom type. D. Umbel type.

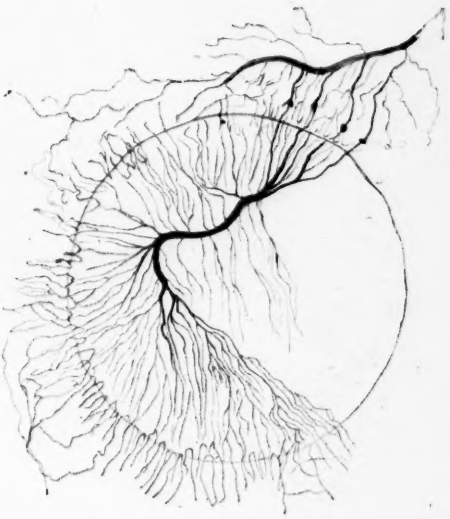

FIG. 2. Formation of a single trunk vessel in the cornea from small vessels at each end.

FIG. 3. Clear geometrical lines in a nebula. Terminal loop vessels at limbus.

FIG. 4. Geometrical lines after interstitial keratitis.

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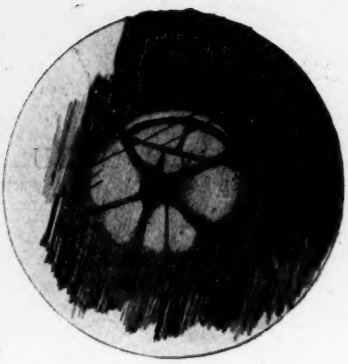

FIG. 5. Geometrical lines. No history. Wedge-shaped masses of corneal haze lying between the ends of an umbel vessel.

FIG. 6. Geometrical lines. No history. Remains of terminal loops.

FIG. 7 and 8. Interstitial vessels which afterwards became geometrical lines

FIG. 9. Geometrical lines and mushroom heads.

FIG. 10. Mushroom heads, tracks of umbel vessels and large sinuous tracks.

FIG. 11. Three mushroom heads on one stalk, the result of three leash ulcers.

FIG. 12. Multiple mushroom heads with gills on both surfaces; senile arcus.

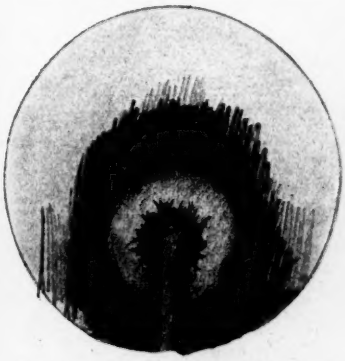

FIG. 13. Mushroom head forming a complete circle, dipping beneath the stalk.

FIG 14. Mushroom head forming a complete circle, with gills on both surfaces.

FIG. 15. Multiple mushroom heads, scars of leash ulcers, one umbel, one geometrical track, all in one cornea.

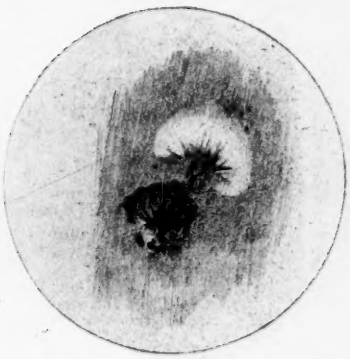

FIG. 16. A mushroom head with an old perforation of cornea.

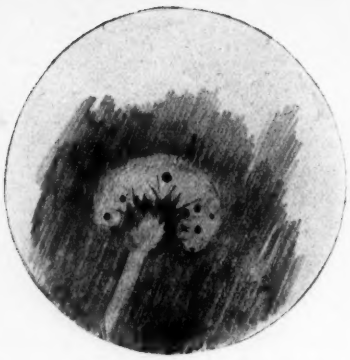

FIG. 17. Mushroom head with circular holes.

FIG. 18. Unusual form of mushroom head after iridectomy for recurrent iritis, the concave edge assumes a geometrical form.

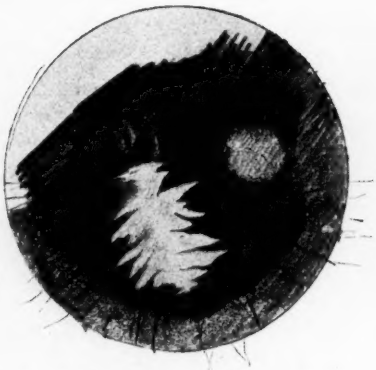

FIG. 19. Secondary opacity shaped like a fern leaf with tracks of vessels.

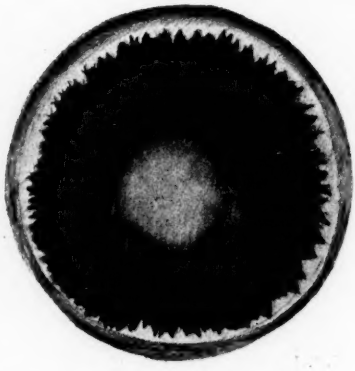

FIG. 20. Complete circle gilled on its concave surface after interstitial keratitis.

FIG. 21. Secondary opacity forming an irregular arcus after many attacks of scleritis.

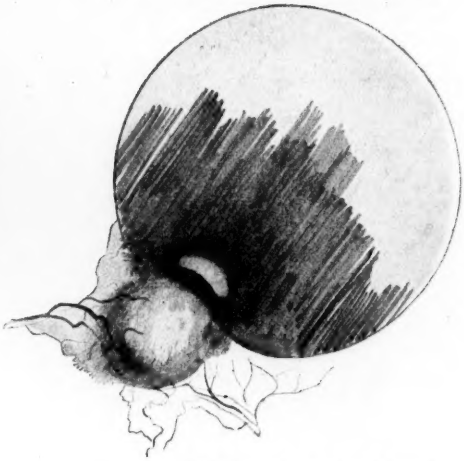

FIG. 22. Secondary opacity after dermoid of limbus.

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JANUARY, 1919

COMMUNICATIONS

ON THE FORMATION OF CLEAR SPACES IN CORNEAL NEBULAE*

BY
W. T. HOLMES SPICER,
LONDON

THE changes in the cornea that follow inflammation are often striking in appearance and interest. No visible sign of inflammation may be left, as is not uncommonly seen after perforation of ulcers in ophthalmia neonatorum, or after mild attacks of interstitial keratitis; on the other hand, such factors as the persistence of vascular channels, the contraction of scars, changes in nutrition, and stagnation of lymph circulation, may bring about slowly advancing changes after all inflammatory appearances have long subsided.

Many of the changes are obscure, and the method of their production is unknown; but even such knowledge as we already possess is of use in the diagnosis, not only of ocular but of general pathological states.

The presence of clear lines in old corneal scars has been described by very few observers, although such lines have been long known, and were seen even before the *loupe* came into general use.

The earliest observation I have of them is a drawing given me

* Presidential address of the Section of Ophthalmology of the Royal Society of Medicine, read on November 6, 1918.

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by Nettleship when he dispersed his collection in 1901; it is a pencil sketch of the two eyes of an old lady of 72, made in 1878, and was headed "Linear paths of clear corneal tissue in large diffuse leukomata, the leukomata probably caused by ulcers after small-pox in infancy." One of the drawings represents the branching form of clear lines in the body of a nebula, the other suggests a geometrical arrangement of lines. The drawing was apparently a single observation and not thought worthy of publication.

In 1893, in the *Beiträge zur Augenheilkunde*, Fuchs published a paper on these lines. He discussed at length the various linear formations which may exist in the cornea, Recklinghausen's canals, Bowman's tubes, and striated keratitis, and suggested that the lines were due to changes in the lymph streams in the nebulous area. He gave a number of sketches which well suggest the main forms of the lines.

W. Adams Frost showed a case of annular opacity of the cornea in 1896 (*Trans. Ophthal. Soc. U.K.*, Vol. XVI, p. 53) which is clearly a secondary opacity round the head of a tuft of vessels.

The best and most recent description of these lines is that of Sydney Stephenson (*Trans. Ophthal. Soc. U.K.*, Vols. XXXIII and XXXV). He gives a very good drawing of a case of clear branching lines running into a corneal nebula from the lower part of the limbus in an old case of interstitial keratitis; his other case is one of lines traversing a nebula with a well-developed secondary opacity. This case had been the subject of repeated attacks of corneal inflammation in early life.

In his remarks Stephenson says: "The clear lines remind one of blood-vessels, and it is probable that such were present when the opacity was recent. The present condition has likely followed resorption of the vessels, and inasmuch as many of the striae are wider than any corneal vessel there has almost certainly been some clearing of the opacity in the neighbourhood of the vascular streams."

In the discussion which followed, J. B. Story said he had seen such lines in cases of interstitial keratitis, and thought they were due to degenerate blood-vessels, or to a clearing round the course of shrivelled vessels. At the same meeting I showed some drawings of such lines.

My own attention was first directed to this subject about 1894 in a case of Marcus Gunn's, in which there was a crosshatch of clear lines in a central nebula; my first attempt at a careful drawing was in a case of Silcock's in 1896. Since then I have recorded cases as they have come, and have often made rough sketches of them; these sketches amount to scores: they have made me familiar with all forms of clear lines and of their surrounding opacity, and I have learned to recognize their essential features.

The advantage of a good drawing is that it is precise, it conveys to the mind the exact appearance so far as that can be done, and it remains a trustworthy record. I owe a great deal to some pen sketches, by an unknown hand, on a Moorfields case sheet of Adams, made eighteen years before I saw the case; it gave information as to the previous state of the cornea, and as to the changes which had taken place such as no description could possibly have given.

As the changes are dependent on the presence of blood-vessels, it will be best to describe the various types of vessels which are seen in the cornea; the types vary mainly according to their depth. Surface vessels pass over the edge of the cornea from the conjunctiva, run beneath the epithelium on the surface of Bowman's membrane, divide and twist freely much like the branching of an oak tree, the *arborescent form:* Fig. 1 A. These occur in superficial inflammations, ulcers or trachoma, and represent free branching uncontrolled by the pressure of surrounding tissues.

Besides this surface invasion of trunk vessels with their branches, the terminal capillary loops of the limbus advance over the cornea in a series of arches or loops not arising from any main trunk; Fig. 1 B. This *terminal loop* form is common in marginal inflammations and ulcers and trachoma; it is also seen in acute or vascular forms of interstitial keratitis in which vessels invade the cornea at almost all depths: it persists as fine silky lines on the surface.

Brush or Besom Form: Fig. 1 C. Vessels entering the substance of the cornea can often be traced from a trunk vessel running on the surface of the sclerotic to a few millimetres' distance from the limbus, then dipping down into the sclerotic and reappearing in the substance of the cornea. These deeply placed vessels are constrained by the layers of the cornea through which they run, to a less free distribution than that of the surface vessels; the course of their branches is more parallel and is more like the branching of a birch tree than that of an oak. This is the type which occurs in interstitial keratitis and other forms of deep inflammation. The leash of vessels which accompanies the fascicular or leash ulcer, although it is on the surface, approaches the brush formation, as it lies in the groove hollowed out by the march of the ulcer, which limits its free development.

Umbel Form: Fig. 1 D. There is another form which occurs in local inflammations of the deeper layers of the cornea, such as chronic abscesses or mild attacks of interstitial keratitis, not severe enough to promote a general vascular invasion, in which a single vessel grows into the cornea from the margin, and remains unbranched till it divides into a number of short straight radiating vessels like the head of a parsley flower.

Generally, arteries cannot be distinguished from veins by the naked eye, but with the *loupe* each vein can be seen single and accom-

panied by one or two small arteries; the veins are larger and darker than the arteries, and the transition from one to the other can be seen to take place without the intervention of capillaries: all these small vessels are to be regarded as capillaries in which the distinction of artery and vein is retained to the final transition.

It is uncommon for vessels to disappear and leave no trace; even though they contain no blood they may generally be seen as fine silky threads lying on or near the surface or as clear lines beneath the surface.

Vessels keep to their own level or layer of the cornea, their branches do not commonly anastomose with those of a different layer; it is possible to see tufts of deep vessels coming from different parts of the cornea crossing and breaking up into their finest branches without joining those coming from another direction, provided that they are at different levels; the layers of corneal tissue are thick and resistent enough to prevent the union of vessels of different layers. In severe cases of interstitial inflammation, the corneal lamellae are softened and may become masses of granulation tissue only; vessels may then penetrate them and communicate with those lying in other layers.

After this has occurred we sometimes find during the subsiding stage of severe interstitial keratitis, large trunks in the substance of the cornea ending in a fine network of vessels on the surface at one end, and at the other end disappearing beneath the limbus after having broken up into small vessels (Fig. 2).

The clear lines divide themselves into two kinds, the geometrical group, and the formation which I have for years called the mushroom cap or coral reef.

Geometrical Lines

These are clear lines in which no trace of haze, opacity, or structure can be seen; they lie in the midst of nebulae. The nebulae are of varying density, sometimes faint clouds, only visible with careful arrangement of illumination, and sometimes densely white and calcareous looking, so that they have been mistaken for lead deposits. The clear lines are perfectly straight or run in large smooth curves; they are sometimes parallel, sometimes diverging or converging, or crossed by other lines, and sometimes radiating from a centre. They are often so perfectly straight and sharply cut that they appear like machine-ruled geometrical figures, such as are seen in the Second Book of Euclid; they are often very much broader than any possible vessels. They can sometimes be traced to the limbus, but are often seen only in the centre of the cornea, and disappear outside it. As they have no visible structure they can only be made visible by the opacity in which they lie; where there is no opacity there are no visible lines.

Generally the opacities can only be seen against the pupil as a background, and require the use of a mydriatic, as well as of properly adjusted oblique illumination. They interfere little with transmission of light, they are less well seen by the ophthalmoscope than by the *loupe;* and they do not interfere greatly with vision: they are extremely thin layers which reflect light at certain angles, and except under such favourable conditions, many of them are not visible.

The explanation of the existence of these lines has been that they are lines of clearance or disappearance of nebulae due to the development of lymph tracks in already formed nebulae.

It is difficult to understand how perfectly straight tracks sometimes equal in length to one-third or one-half the corneal diameter could make their way across existing nebulae—they have no resemblance at all to Recklinghausen's canals or to Bowman's tubes, and if they had we should have to show how a lymph channel could be formed in the substance and at the expense of the nebulous material.

They have as their basis the tracks of old vessels; there can be little or no doubt about this, the process has been watched. In one case of interstitial keratitis I had made a sketch note of the presence of a large tuft of vessels invading the cornea (Fig. 7). I saw the patient some years later during a recurrence in the other eye. Some of the old blood tracks previously noted had become perfectly straight, as if stretched longitudinally, and had lost all their irregularities; others had disappeared. The geometrical formation was present (Fig. 8). In one or two cases I have detected a faint ruby tinge in the geometrical lines; they evidently still contained some blood colouring matter.

I believe the explanation to be the following:

At a certain depth within the layers of the cornea a tuft of brush vessels makes its way; at the end of the attack, the vessels shrink and lose their blood, but remain as potential channels. These channels become greatly flattened from compression in the layers of the cornea, during and after subsidence of inflammation, and owing to this they have a much greater width than when they contained blood.

The contractile process which follows all attacks of inflammation produces a stretching along the course of the newly-formed vessels confined to the coat of the vessel and its immediate neighbourhood; it is so limited that it does not interfere with the same process going on in neighbouring vessels. The result of the stretching is to straighten the course of the vessel, to remove inequalities and deviations, and to give it the geometrical quality of a straight line, the shortest distance between two points.

When vessels invade the cornea they go in response to some irritating cause which may be quite small and local, the rest of the

cornea may be little involved, and may be capable of complete restoration except for the presence of the vascular channels. The effect of vessels running through healthy cornea is an interference with the lymph circulation, i.e., with the flow of nutritional elements; where this interference is continuous and prolonged the cornea becomes opaque. It is this secondary opacification which makes the old vascular channels visible, and is more likely to occur at the centre of the cornea than at the periphery which is nearer the sources of supply.

The conditions most likely to result in these lines are acute vascular cases of interstitial keratitis which run a rapid course and result in little or no change of a permanent kind in the endothelium; if there is much change in the posterior part of the cornea the lines are masked or invisible. Insterstitial keratitis is not a necessity; any cause which produces a brush of deep vessels may have as a result geometrical lines.

Of 25 cases of geometrical lines investigated as to cause, in 6 there had been interstitial keratitis; in 2 cases ulcers and interstitial keratitis, and in 2 others probably interstitial keratitis. In 2 there had been an injury with perforation of the cornea; in 11 there had been ulcerations of various kinds penetrating deeply into the cornea, and in 4 no history could be obtained and no evidence of the nature of the case could be found.

Mushroom Cap

The second group of cases, to which I have given the name mushroom cap, forms quite a striking and beautiful object with the *loupe*, and is easily seen as to its main features by the naked eye. It has the appearance that a section of a mushroom would have if carried through the side of the stalk and head, showing the stalk in section, the crescent shaped head with the gills on its concave edge. The stalk is of a delicate blue-grey colour, and can often be followed to the edge of the cornea; sometimes it can only be traced for a short distance or made out as a nebulous spot within the concavity of the crescent. Vestiges of vessels can often be made out on the stalk, not extending as far as the head of the mushroom: between the head and the stalk there is an interval of clear cornea. The head of the mushroom is crescentic in shape, densest on its concave edge, fading away to nothing on its convex edge. The concave edge is almost always fringed with prolongations of the opacity towards the geometrical centre of the crescent; these are like the gills of the mushroom. The crescentic head of the mushroom contains neither blood-vessels nor remains of them, except when crossed by vessels belonging to another system. The head is of a different colour from the stalk, having a dirty white or buff colour in contrast with the cool grey of the stalk. It is very thin,

as may be easily seen if looked at from one side, and appears confined to one layer of the cornea. Sometimes the crescentic head becomes a complete circle, surrounding a central spot, the coral reef; but generally the stalk can be seen passing out to the edge of the cornea. Where this happens the complete circle dips behind the stalk; the stalk appears to be always superficial to the head of the mushroom.

Besides this simple arrangement of a single mushroom, there may be two or more systems, each with its head and stalk, crossing one another so that we get clear lines running across the head; or coalescing with each other so that we may have an opacity with gills on both sides; all such complications will be understood if one gets to recognize the characteristic forms of stalk with its terminal vessels, having fringes of opacity coalescing into a mass.

There can be little doubt as to the nature of these mushroom heads. They are not the scars of ulcers themselves, they are too large, too smooth, and too much like each other; they are different in colour from primary nebulae. They have also been seen to form; they appear a certain time after an ulcer has come to an end, the shortest time I have noticed is 9 months, but I have had notes of a case from Mr. Foster Moore of an officer who got a corneal ulcer in Gallipoli, was watched during treatment and convalescence from August to December, 1915. There was no secondary opacity then, but he was warned by Foster Moore that a secondary opacity might come. Four months later a fine mushroom cap had appeared.

They are secondary to ulcerations which have been attended by invasion of the cornea by blood-vessels; they appear specially to follow the fascicular or leash ulcer, but remain isolated from it by a space of clear cornea; the fringes of opacity seem to dip down between between the areas supplied by each terminal loop of capillary vessel.

A form of mushroom head is also seen after attacks of scleritis in which the cornea has not taken part; they are often the same in appearance as the mushroom head, that is, crescents of opacity lying in perfectly clear cornea with the concavity directed towards the scleral focus of inflammation. Successive attacks of scleritis may each have its secondary opaque crescent in the cornea, which may interlace or may form a continuous wavy band resembling an irregular arcus senilis. The opacities secondary to scleritis are not so generally gilled on their concavity as the purely corneal ones.

Similarly dermoid tumours at the edge of the cornea, pigmented moles or naevi of the same region may have secondary opacities.

The first necessity for the formation of all these secondary opacities is destruction of tissue attended by ingrowth of blood-vessels; the contraction which follows either interferes with nutrition, or interrupts the flow of lymph through the cornea in

their neighbourhood leading to stagnation, concentration, and deposit of salts.

There is some resemblance beween these opacities and the arcus senilis; the arcus is more likely to occur in eyes which have had corneal ulceration, that is, where nutrition has been interfered with; the clear space between the outer edge of the arcus and the scleral edge is analogous to the clear space between the concave edge of the cap and the end of the leash of vessels.

In one or two cases, round clear holes, like those found in the calcareous bands, have been seen; but no evidence of calcareous deposit, such as roughening of the surface, has been seen even where the mushroom has existed for seventy years.

AN UNUSUAL CASE OF IDIOSYNCRASY TO QUININE

BY

LIEUT.-COLONEL ROBERT HENRY ELLIOT, I.M.S. (Ret.)

LONDON.

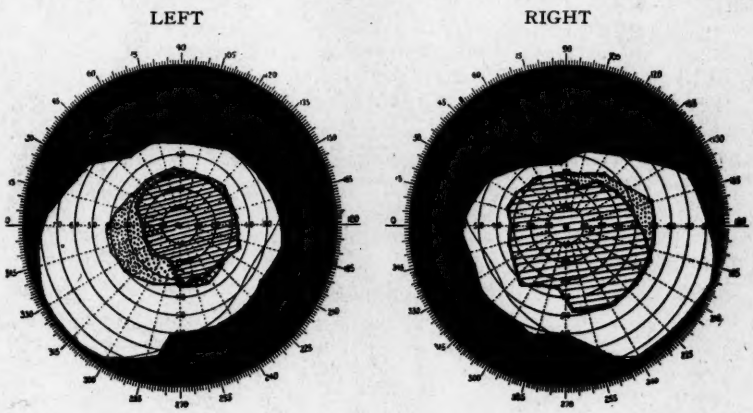
MR. A. G., a dispensing chemist, understanding that the writer was interested in quinine poisoning, consulted him as to the nature of certain unpleasant symptoms, which he experienced when he took low doses of ammoniated quinine or of any other form of the drug for influenzal colds. He stated that within a quarter of an hour of taking the drug, he suffered from headache, deafness, a difficulty in seeing clearly, and a contraction of his field of vision. At the same time, he found a difficulty in reading, the letters appearing doubled. He consented to take a low dose for the purpose of observation. That actually taken was 2 grains of powdered sulphate of quinine in a cachet. Being a very busy man, the time he could give was limited.

On examination beforehand, it was found that the edges of his disc were slightly blurred and surrounded by faint haloes; the appearances suggested that he might at some time have had a very mild optic neuritis; the colour of the discs was normal. He stated that some years previously, he had had a severe attack of influenza, and had noticed that his sight had been worse ever since. The R.E.V.=6/6 nearly, not improved by spheres; L.E.V.=6/6 slowly but correctly; the diameter of each pupil=3·5 mm.; he read No. 1 type easily with his own glass at 41 cm.

Twenty minutes after swallowing the quinine, he had a headache, and was deaf and rather slow in manner. R.E.V.=6/12 partly; L.E.V.=6/6 partly; the optic discs were decidedly paler than before, and the arteries were slightly but distinctly lessened in

calibre. He read the same type as before at 41 cm., but had much more difficulty in so doing. Examined three quarters of an hour after the original dose, the pallor of the discs was accentuated, and the arteries were smaller, one of the latter (supero-temporal branch, R.E.), which showed a sharp kink under ordinary circumstances, now appeared to have its lumen obliterated at this point. The pupils were each 4·5 mm. in diameter as against 3·5 mm. before the induction of cinchonism. They reacted to light and slightly to accommodation.

The most remarkable changes, however, were in the fields of



The white areas show the normal fields, as taken before quinine was administered. The shaded areas show the fields taken half an hour after the dose of 2 grains of powdered sulphate of quinine. The dotted areas show the portions added to each field 15 minutes after a cup of strong coffee had been taken and one hour after the original dose. At this time he stated that he felt his fields were improving. The examination was made with a 1 mm. moderately bright spot, with a self-lit electric perimeter, in a dull light in a dark room. Under these conditions, the normal fields should have been a little over the full.

vision, as shown in the accompanying charts. The outside white limits represent the fields before the experiment commenced. The shaded areas show the portion of field left when taken half-an-hour after the quinine was administered. A self-lit electric perimeter was used, the object employed being a 1 mm. spot of moderately bright light, which in a normal eye should have given a full normal field. It will be observed that it did not do so, even before the drug was given, thus suggesting that the optic nerve was not wholly normal to start with. A control experiment was made on a patient who had occasion to take 10 grains of hydrochloride of quinine; his fields, etc., remained quite unaltered.

The patient had stated that a cup of coffee relieved his symptoms and speedily restored the field to normal. He was accordingly

given a cup of strong coffee 45 minutes after the quinine dose. His fields were taken a quarter of an hour later, at which time he stated that he was beginning to feel better; the resulting improvement in each field has been shown by dotting the area gained. The patient's time being limited, the experiment had to be brought to an end. The colour vision remained normal throughout. It was not possible to test his light sense in the time available.

Remarks.—The main interest of the case lies in the fact that the dose given is the lowest yet recorded as having provoked quinine amblyopia, with a record supported by a careful examination of the patient. The extent of the reduction of the fields is remarkable, but the patient maintained that it was much less than he had often experienced. He attributed this to the good state of health he was in at the time. Possibly the fact that he took the quinine in powder instead of, as he had previously often done, in a solution of the ammoniated drug, furnishes a more reasonable explanation. The writer was naturally handicapped by his anxiety not to overdo the effect produced.

Caffeine has been recommended in the treatment of quinine amblyopia. A doubt as to the advisability of using this drug as a remedy might arise from Schwabe's case of a woman of 33, who had suffered for years from quinine amblyopia, and whose fields were always rapidly contracted by the ingestion of strong tea or coffee. That case is a very difficult one to understand, and the observations now published appear to indicate that caffeine has justly earned a reputation in the treatment of quinine amblyopia.

The question arises as to whether the original trouble with his vision may not have been due to the quinine then taken, rather than to the influenza. It is quite clear from the records of other cases that a previous decided attack of quinine amblyopia may render a patient unduly sensitive to the action of the drug ever afterwards.

The large doses in which some experts in tropical disease are advocating nowadays that quinine should be administered, raise a situation which demands that all cases of quinine amblyopia should be published. It seems doubtful if they have realised the danger that threatens the patient from the ophthalmic side of the question.

THYROID THERAPY IN OPHTHALMIC PRACTICE

BY

PERCY DUNN,

LONDON

TWO years ago I contributed to the *Lancet* a paper entitled "Some Aspects of the Ciliary Body in Health and Disease,"* detailing

* The *Lancet*, 1916, Vol. 1.

experiences gained of thyroid therapy in ophthalmic practice. As supplementing that paper, at the request of our editor, the following remarks are submitted, partly based upon additional experience, partly in an attempt to justify drawing further attention to the subject. The dominant factor, emphasizing this suggested treatment, is the natural inference that without blood above suspicion in its freedom from toxic influences, the eye cannot maintain its resistance against pathological reaction; that a tissue of such delicacy and vascularity as that of the ciliary body should exhibit a disproportionate responsiveness to a toxic blood supply, is, under the circumstances, natural. There are many causes of toxaemia in which this responsiveness is displayed; these causes vary in their manifestation and effects; some are more prone than others to excite a reactionary process, and among them two, at least, are accompanied by signs, in which hypothyroidism is distinctly marked, namely intestinal putrefaction, and septic foci, such as in pyorrhoea alveolaris. The sequence of hypothyroidism in such cases is easily explained. One of the functions of the thyroid is to "exercise a protective, anti-toxic and immunising action, defending the body, not only against toxic products of its own metabolism, but against invasion by disease-producing micro-organisms and injury by their products."* As long as the protective influence is maintained, pathological reaction is held in abeyance; as soon as that protection fails, reactionary processes ensue. Thus hypothyroidism, its existence being demonstrated by general signs, is of manifest import in ophthalmic practice. The irido-cyclitisof pyorrhoeal origin is a symptom, not a disease *sui generis*, and the determining cause of its incidence is failure of the thyroid to control the toxaemia of which the sepsis is the source. What is true in this regard of pyorrhoea alveolaris is also true of the iridocyclitis, commonly described as "keratitis punctata." Here the intoxication is perhaps most generally due to intestinal putrefaction. The fact remains that "keratitis punctata" is associated with a notorious reputation for intractability to treatment; the attribution of the inflammatory signs to toxaemic influences is recognized, but the failure of the thyroid to control the toxaemia is apparently overlooked. Hence the custom is to treat this irido-cyclitis upon general lines, with what satisfaction can be derived from fervent hope that improvement may in time follow, and yet this form of irido-cyclitis is essentially a hypothyroid manifestation. In this there may be, also, an underlying cause apart from, or in addition to, the intestinal putrefaction, inasmuch as I have found in many instances a family history of tuberculosis in the patients.

"Keratitis punctata" being, then, a symptom of toxaemia, as such it also postulates thyroid insufficiency, and hypo-thyroidism

* The Thyroid Gland in Health and Disease. By Robert McGarrison, p. 21, 1917.

calls for thyroid therapy, a treatment which has proved very beneficial in the cases in which I have used it.

Let it also be remembered that an ill-functioning thyroid determines the virulence of a toxaemia and its effects. In varying degree the toxaemia, uncontrolled by thyroid action, reacts upon and depresses the nutrition. Thus we find corneal ulcers lagging in their repair, others spreading with an infective margin, others again accompanied by hypopyon. Logically, it may be presumed that none of these conditions would prevail were the toxaemia modified by thyroid activity. Where that control has failed, it must follow that the micro-organism is enabled to exert the maximum of its powers, and especially amid tissues defenceless from perverted nutrition; the virulence displayed in certain cases of a pneumococcal infection of the cornea must belong to this category. Of these infections hypopyon is not an uncommon complication. In such cases the toxin, passing through Descemet's membrane into the anterior chamber, acts as an irritant; an exudation of polymorphonuclear cells is the result, and the incidence of the hypopyon is the reflex of the virulence of the infection. It is arguable whether a fully-functioning thyroid could not check the formation of a hypopyon in all cases of pathogenic invasion of the cornea. Collateral evidence lends support to this view, a view which also suggests that the thyroid factor may explain the variability in infectivity which the pneumococcus displays. In the paper, "Some Aspects of the Ciliary Body in Health and Disease," the belief is expressed that interstitial keratitis is more a hypothyroideal manifestation than a syphilitic one. Hypothyroidism dominates the cases: the small patients are generally abjectly miserable in appearance, thin, dejected, nervous, physically weak, without desire for food, in bad cases intensely photophobic, and only tolerant of themselves and others when left undisturbed, buried among the bed clothes. To treat such children with 606, or otherwise anti-syphilitically, is heroism misplaced. When general nutrition is good, a disease-tainted tissue may be able to maintain a functional balance of health; but when diminished resistance becomes the prevailing factor, then is the way open for the pathological bias of that tissue to become manifest. Again, a determining influence in these cases is possibly a taint of tuberculous origin. Zimmerman and others have found in the cellular infiltration of the cornea signs suggestive of tubercle. Whatever the cause may be upon which the thyroid insufficiency depends, the symptoms associated therewith are the first demanding treatment; and so, acting on this principle, I have found cases of interstitial keratitis yield quickly and satisfactorily to thyroid therapy.

Hypothyroidism may next be referred to in a different connection in relation to ophthalmic practice. At the menopause it has been

shown that the thyroid is always functionally deficient. "At this time symptoms of hypo-thyroidism are apt to appear in women who throughout their child-bearing period have been sub-thyroidic. The stimulus of pregnancy to thyroidal activity during this period had sufficed to mask the gland's defect, which had become apparent on its withdrawal" (McGarrison). Many such patients, I feel sure, come under the notice of the ophthalmic surgeon. They are represented by anomalous eye symptoms—anomalous because no ocular cause can be found to account for them—such as aching of the eyes, more or less headache, a feeling of fatigue in the eyes after a short period of reading and close work. The general signs, however, of hypo-thyroidism in such patients are usually not definite. On the other hand, complaint is made of persistent "rheumatic" pains in the limbs and other parts, a prevailing lack of energy, and a dulness of spirit. If any refractive defect be present, the ocular signs are not relieved by its correction, for underlying it is the hypo-thyroid state, unsuspected, but nevertheless active. The proof is furnished by the relief obtained from thyroid treatment. In the course of the treatment the patient enters upon a new phase of life, in which troublous symptoms, for a long time persistent, vanish. "I have never felt better in my life," said a patient of the kind the other day, as the result of thyroid administration. And other similar cases have obtained the same relief. This has been an experience gained partly by following a rule—"when in doubt, try thyroid"; and on many occasions appreciation of the benefit has been expressed by patients in consequence of the adoption of that precept.

Another aspect of this subject may now be briefly considered. It is worthy of note that among the signs of thyroid inadequacy is haemorrhage. The evidence upon this fact is well authenticated, as reference to standard authorities will show. Possibly this sign has some, if not a close, bearing upon haemorrhagic manifestations in the case of the eye. There is the common form of sub-conjunctival haemorrhage, usually attributed to gout, suddenly occurring in middle-aged women. There is what may be regarded as its analogue, sub-retinal haemorrhage, similarly supervening. The causes of retinal haemorrhages include a large variety, but Leonard Williams was the first to point out that among them he had noted thyroid insufficiency. He relates the following case.* An ophthalmic surgeon sent him a patient showing a fairly extensive retinal haemorrhage, with the suggestion that the cause was probably renal. The examination, however, in pursuit of that hypothesis proved entirely negative. On the other hand, definite evidence of hypo-thyroidism, on further inquiry, was present. Williams was impressed by this discovery, and it has led him to make a

* *American Medicine*, April, 1914, p. 273.

point of ascertaining from patients suspected of hypo-thyroidism, whether this detail of haemorrhage had become noticeable in their case. This observation lends some significance to the haemorrhages in which the eye is concerned. A recurring subconjunctival haemorrhage pointing to hypo-thyroidism, should be accepted as a warning sign of a condition demanding thyroid treatment, in order to avert the contingency of the retina becoming the seat of the extravasation. Possibly a greater or less tendency to haemorrhage, in such cases, is general. Arterial haemorrhages, for example, presuppose cerebral contingencies of a similar nature. Eales some years ago reported "a series of cases of recurrent haemorrhage in the retina and into the vitreous from the retinal vessels, associated with epistaxis in young males in whom constipation and high arterial tension were present."* The cause of the haemorrhage was attributed to the constipation. Lawford, however, in commenting upon these cases takes a different view. "These cases," he writes, "albeit rare, are now fairly well known, and although the association of symptoms noted by Eales has been repeatedly observed, it seems most probable that there are more factors than one concerned in the production of the ocular lesions, and that constipation in young people does not *per se* lead to extravasation of blood from the vessels."† In support of that considered belief, expressed twenty-eight years ago, the fact remains that among the various signs of hypothyroidism, haemorrhage is one, and persistent constipation another.

A few concluding remarks suggest themselves upon this subject, not from a therapeutic, but from a psychological aspect. The tendency more or less prevails to regard advocates of thyroid treatment as persons who take pot-shots at disease with thyroid tablets, and who, when succeeding occasionally in scoring a bullseye, persuade themselves that a thyroid target is the only one at which to aim. In short, that they elevate their practice into a "hobby," which they are prone to pursue always and on any occasion. I am not prepared to say that there is nothing in this criticism; but no doubt it is exaggerated. Meanwhile, it implies that thyroid advocates view their cases through thyroid eyes, a vision which focusses a thyroid glass upon disease generally, a vision which is distinguished by a contracted field. But this is not a correct representation of the facts, either in respect to the much debated organ, or to those who have faith in the therapeutic value of its substance. It should be borne in mind that the literature of the subject has now assumed massive proportions, and is soundly based upon physiological inquiry and research. That literature has

* *Birmingham Medical Review*, 1880.

† On Ocular Lesions dependent upon Disorders of the Secretory and Excretory Organs. Norris and Oliver, Vol. IV, p. 684.

shown that the thyroid is the outpost of the defensive organic army of healthy nutrition. As Hertoghe has stated, "All the great causes of pathological disturbance, tuberculosis, syphilis, alcoholism, paludism, chronic starvation, consanguinity, etc., aim their first blow at the thyroid."* The admission, therefore, is unavoidable that thyroid therapy cannot be regarded as a "fad," liable at any time to be cast aside as a discredited fashion. Every day additional knowledge is being gained of its beneficent reality, and no one in these days can afford to neglect its teaching. Hertoghe's forecast, therefore that "the day is coming when we will interrogate the thyroid equation (hypo- or hyper-) in all our patients with the same fidelity that we inquire into their previous history, in respect to tuberculosis, syphilis, and alcoholism," may come to be realized in practice. The old common saying "a man is as old as his arteries" is sadly out of date. Its misconception lies in its recognition of effects rather than of causes. A truer axiom would be "a man is as old as his thyroid," for it is the thyroid, as the regulator of nutrition, which keeps an old man, with vigour of mind and body, young, by counteracting auto-intoxication—Metchnikoff's theory of the cause of old age. It is the thyroid, too, which prevents and controls the advent and progress of arterio-sclerosis. Oftentimes dulness of spirit and a disturbing melancholy, irrepressible by volitional effort, are of toxaemic, and not of psychological origin: in such cases by stimulating a tired thyroid, the buoyancy of life is restored, and the mist-clouds of despondency dispersed. Finally, if thyroid therapy fails to yield the miracles expected of it after due trial, that is proof that the gland is in no need of assistance.

CURIOUS RESULT OF EXPLOSION INJURY TO EYE

BY

W. A. ANDERSON, Capt. R.A.M.C.

Eye examination of Pte. B——, March 20, 1917.

Two and a half years ago, whilst in the north island of New Zealand, he lit in a fire a roll of paper which, unknown to him, contained a tin of detonators. These exploded, and he was knocked over and wounded in several places, and a very small fragment entered the right eye, as the result of which he states he was blind for several days afterwards.

R. eye. To the nasal side of cornea, in the horizontal plane, there is a small, dark spot; ? point of entry of foreign body.

* *American Medicine*, April, 1914.

R. cornea. Upper half of cornea shows fine keratitis, and from the centre of the cornea, stretching downwards and inwards, there is an irregular line-like opacity.

Iris is the same colour as that of the left eye and dilates regularly under homatropin.

Lens. Anterior lens capsule shows a distinct negative photograph of iris; the pupil can be recognized and is 2 to 2·5 mm. in diameter. Immediately around the pupillary area the impression on the anterior lens capsule is dense, and radiating outwards are many bands of similar density.

Vitreous shows many opacities, with one more solid than the rest close to posterior surface of lens.

Vision: R.E. 6/12 and reads Sn. 0.6.
L.E. 6/6 and reads Sn. 0.5.

Refraction, under mydriatic:

	+1·00		+1·50
—	+1·00	—	+1·00

Shadows are somewhat irregular in the right eye. Pupils active. Tension normal. No fundus changes seen. X-ray negative.

L. eye, normal.

I am unable to account for the changes as described. They form a beautiful picture, and the whole, as I have said, is a splendid "negative photograph" of the iris.

Some change must have taken place inside the eye, between the foreign body and the fluids of the eye, producing some substance which combined with the pigment of the iris to form on the lens capsule a photograph as described.

No other colour changes were found in the eye.

INTRA-CRANIAL SARCOMA, WITH EARLY SYMPTOMS OF ACUTE RETRO-BULBAR NEURITIS

BY

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HON. SURGEON MANCHESTER ROYAL EYE HOSPITAL, ETC.

ON August 3, W. R., æt. 16, was sent to me by Dr. Barritt. He complained of vision in the left eye being blurred for one week and getting worse two days before I saw him. There was peri-orbital aching and slight pain on movement of the eye, and also when the eye was pushed backwards.

Vision R. 5/4. L. Fingers. Fundi normal.

There was a family history of tubercle, but general health fairly good. I diagnosed acute retro-bulbar neuritis, and prescribed usual remedies.

Appended is an account of the progress of the case.

August 10. Paresis of L. sixth nerve.

August 12. Vision of left eye worse. No P.L. Slight blurring of the optic disc. No injection of the eye. Movements limited in every direction, especially outwards. Normal temperature. The patient could not smell with the left nostril. On examination by Mr. Lindley Sewell, nothing abnormal in the left nasal cavity. Other cranial nerves normal. No pulsation, no bruit, and nothing felt in the orbit.

Radiogram showed absence of the left frontal sinus.

August 16. Complained of right eye. V. = 5/4. Fundus normal.

August 19. Marked proptosis of the left eye, and some chemosis of the conjunctiva. Left pupil widely dilated and fixed. Movement of the left eye very limited in every direction. R. V. = J. 20. Fundus normal.

August 20. Mr. Lindley Sewell explored the region of the left frontal sinus and exposed the dura, but found no evidence of the sinus or of growth. The left eye was enucleated but no evidence of growth found in the orbit.

August 22. R. eye hand movements on nasal side only. No proptosis, movements good. Slight blurring of optic disc.

August 24. R. V. = P.L?

The patient died three weeks later, and post mortem a flat sub-dural growth was found, evidently arising in the region of the sella Turcica on the left side, spreading to the middle fossa, and over the small wing of the sphenoid to the right side. The growth showed the characters of a periosteal sarcoma.

NARROW AND SPIRAL FIELDS OF VISION IN HYSTERIA, MALINGERING, AND NEURASTHENIA

BY

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AND

J. L. M. SYMNS, M.A., M.D.Cantab.

RETRACTION of the field of vision has been regarded as the most characteristic "stigma" of hysteria since Charcot first drew attention to it in 1872. Janet[1] considered it to be "the emblem of hysterical sensibility in general," and it led him to describe

hysteria as a condition due to the "retraction of the field of consciousness." Among ophthalmologists de Schweinitz[2] regards the sign as a "permanent stigma" of hysteria and regards it as a very valuable aid to diagnosis. But Babinski[3] who, as *chef de clinique*, had watched the development of Charcot's views on hysteria, soon felt himself forced to reject them, as he found none of the so-called stigmata in any of a series of 100 consecutive cases of hysteria, examined in great detail by methods which excluded the possibility of suggestion. The distinguished French oculist, Morax[4] a former assistant of Charcot, from whom he learnt the supposed significance of the retracted field of vision, at first continued to find it in almost every patient suffering from hysterical symptoms. But over twenty years ago he became a convert to

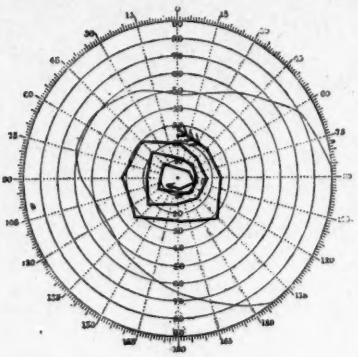

FIG. 1.—Right eye without-inward spiral field of vision in case of hysterical paraplegia.

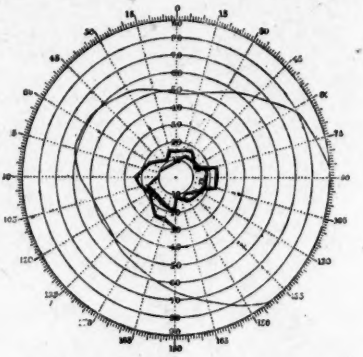

FIG. 2.—Spiral field of vision (after Purves Stewart).

Babinski's views, and since then he has not seen a single case of hysterical retraction of the field of vision. As it is almost impossible to avoid suggesting a narrow field of vision with the perimeter in highly suggestible patients, he has introduced simpler methods for use with hysterical subjects, in which a finger or other familiar object is employed, and although these appear at first to be less accurate, they have the great advantage of making it easy to avoid suggesting abnormalities in the field of vision during the examination.

Apart from hysterical amblyopia, we have never seen patients with hysterical symptoms, who spontaneously complained of disabilities resulting from a narrow field of vision, however closely they were cross-examined on the subject. But if a narrow field of vision is produced by testing with the perimeter, the patient may subsequently complain of considerable inconvenience as a result of the cutting off of his peripheral vision.

We have examined numerous soldiers suffering from various war neuroses, who were abnormally suggestible as a result of the stress and strain of active service, some, but not all, of whom were suffering from gross hysterical symptoms, and we have never found any retraction of their field of vision until they were tested with the perimeter. But the perimeter invariably resulted in the suggestion of a narrowed field, however carefully it was used. Moreover, if the examination was continued after the first field was marked out, a spiral field was always obtained (Fig. 1), identical with that which has hitherto been regarded as a stigma of hysteria (Fig. 2). We believe that the reason why a spiral field of vision, which is the natural result of continued suggestion, has not been found in a larger proportion of hysterical cases showing a narrow field of

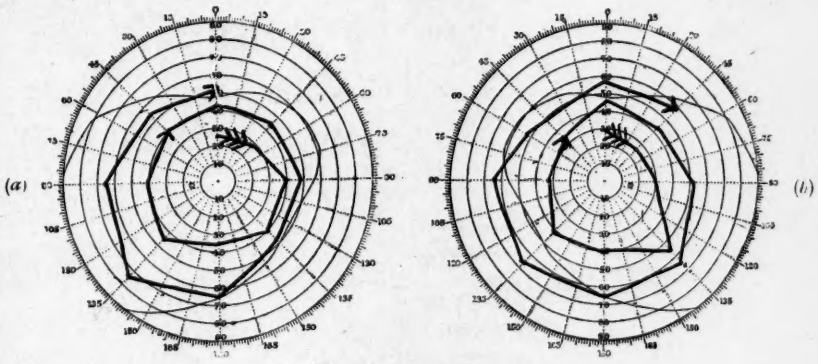

FIG. 3.—Spiral fields in case of hysterical tremor following shell-shock.
(*a*) LEFT EYE. Within-outward spiral field.
(*b*) RIGHT EYE. Within-outward spiral field.

vision is simply because it has not been looked for, the examiner being content when he has marked the limit of vision a single time in each direction.

It has generally been taught that a spiral field of vision is a result of fatigue, and it has even been stated that it is more frequently a symptom of neurasthenia than of hysteria. We have found that this is not the case, the inward spiral, which has hitherto alone been described, being a result of the method employed in using the perimeter.* We have found that an *outward* spiral is always obtained instead of an inward one, if the white disc of the perimeter is moved outwards instead of inwards, as is commonly done (Fig. 3). We have in this way often produced an inward spiral

* In the description of the perimeter given in the four books on ophthalmology, two on neurology, and one on clinical methods which we have consulted, instructions are given to move the disc from without inwards.

for one eye and an outward one for the other (Fig. 4), or an inward spiral one day and an outward spiral another day with the same eye. There is no question of any special suggestions made by us in our method of using the perimeter, as identical results have been

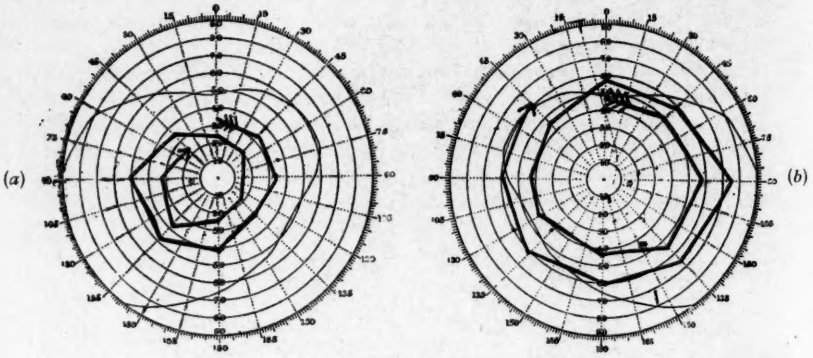

FIG. 4.—Spiral fields in case of hysterical mutism and tremor following shell-shock.
(*a*) LEFT EYE. Without-inward spiral field.
(*b*) RIGHT EYE. Within-outward spiral field.

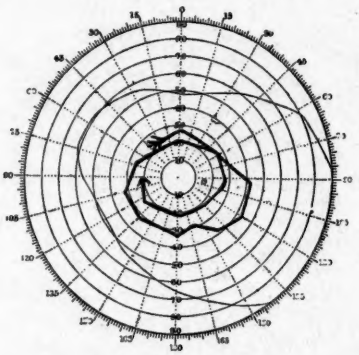

FIG. 5.—Spiral contraction of field of vision in a case of "experimental malingering."

obtained by other observers, who marked out the fields of vision for us without knowing the nature of the cases or the object we had in view in obtaining the tracings. Moreover, we have always obtained normal fields in normal individuals, whether the disc was moved inwards or outwards.

In the course of some investigations on "experimental malingering," we asked 27 individuals, who were pretending that they were paralysed on the right side as a result of a railway

accident, for which they were claiming compensation, whether they could see as well with the right eye as the left. Seven replied that they had noticed some impairment of vision in the right eye. On testing the field of vision with a finger, no narrowing was observed, and they explained that the deficiency they had spoken about was a blurring or general loss of clearness of vision. But when tested with a perimeter all of the seven showed a narrow field on the right side, and one had a slighter narrowing on the left side. In the only two cases in which it occurred to us to continue the investigation after the first field had been marked out a spiral was obtained (Fig. 5), which was identical in character with that supposed to be characteristic of hysteria.

1. P. Janet.—*Etat Mental des Hystériques*, 1911.
2. de Schweinitz in Posey and Spiller's *The Eye and Nervous System*, 1906, p. 625.
3. J. Babinski.—*Semaine médicale*, 1909, Vol. XXIX, p. 3.
4. Quoted by J. Babinski and J. Froment.—*Hystérie-Pithiatisme*, p. 66, Paris, 1917.

HEREDITARY GLIOMA OF THE RETINA

BY

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IN the *Transactions* of the Ophthalmological Society of the United Kingdom for 1917, two instances of families affected with hereditary glioma retinae are recorded by Mr. Hill Griffith, who suggests that, in view of their rarity, all such cases should be published.

The following case was recently seen in the clinic under the charge of Dr. J. V. Paterson, at the Edinburgh Royal Infirmary.

The father, A., when six months old, had his left eye removed by the late Argyll Robertson, "for a tumour." Unfortunately, no contemporary record is available, but there can be no doubt that the eye was removed on account of glioma.

A. was married in 1912. Family:

1. Still-birth, "six weeks overdue." 1913.

2. George. 1914. The parents noticed something wrong with the right eye when the child was six weeks old. At eight months, the eye was removed. In June, 1916, glioma of the left eye was apparent, and the orbit was exenterated in 1917. Metastases occurred all over the body, the head became horribly deformed and enlarged, and death supervened in 1918.

3. Mary. 1916. Parents noticed something in the left eye at six weeks. When the child was later brought to the hospital, glioma was diagnosed. Operation was refused and death occurred from broncho-pneumonia soon afterwards.

The literature is given in Mr. Griffith's paper, though unfortunately some errors have crept into the references. The present case makes the eighth on record, and the third with transmission from the father. Owen's case is the earliest, the father's eye having been removed in 1859, the child's in 1898. The second case in chronological order is that of de Gouvêa, in which the father's eye was removed in 1872. Until recently the existence of hereditary glioma was doubted; its appearance has followed, and probably largely resulted from, advances in medical skill, such as the adoption of chloroform anaesthesia and the development of ophthalmoscopic diagnosis: measures which now often enable individuals to attain the age of reproduction, who would previously have died in childhood. It is, therefore, to be expected that these cases will be more numerous in future.

Writers on glioma are generally agreed that the beginning of the disease always, or at least very often, takes place in intrauterine life. In the present case, and in both of Mr. Griffith's families, still-births occurred. It would be of great interest if it could be ascertained whether still-births are relatively more numerous in gliomatous families and what is the exact cause of foetal death in such cases.

My thanks are due to Dr. J. V. Paterson for kindly permitting the publication of this case.

COUNCIL OF BRITISH OPHTHALMOLOGISTS

Report on Standard Illumination of Snellen's Distant Test Types

THE Council of British Ophthalmologists appointed a committee in July, 1918, to determine a standard of illumination of Snellen's test types of distant vision. The Committee consisted of the following members: Sir George Berry (Chairman), Sir Richard Glazebrook, C.B., F.R.S. (Director, National Physical Laboratory), Mr. Leon Gaster (Society of Illuminating Engineers), Mr. J. Herbert Fisher, Col. J. Herbert Parsons, Mr. A. B. Cridland, Mr. C. C. Paterson, O.B.E., and Mr. W. H. McMullen, O.B.E. (Secretary). The unanimous report of this committee was, after full consideration and discussion, adopted and is now issued by the Council.

Report of Committee on the Illumination of Snellen's Distant Test Types

The effect upon visual acuity of variations in the illumination of test objects has been the subject of a series of careful investigations

since the time of Tobias Mayer (1754). Two chief facts emerge from these researches: (1) that there is a rapid rise in acuity as the illumination is increased from zero up to about two foot candles*; (2) that above two or three foot candles there is scarcely any appreciable rise in acuity. The results obtained by different observers are not entirely concordant, the discrepancies being attributable to variations in the test object, contrast, size of pupil, etc. So far as the testing of visual acuity for clinical purposes is concerned, it appears to be sufficiently accurate to regard the results obtained with an illumination of three foot candles or more as valid and comparable under the ordinary conditions of clinical testing.

There is, however, no doubt that this minimum is by no means always ensured under the actual conditions in which the testing of candidates for military or other public services occurs. Apart from the fact, which should be borne in mind, that the test types often do not conform to Snellen's criteria, they are frequently dirty, thus diminishing contrast, are varnished, thus giving rise to disturbing direct reflection of light, and are viewed under very great variations of daylight, in rooms which are often ill-suited for the purpose.

It is possible to lay down precise and simple rules for the efficient illumination of test types, and we see no reason why these rules should not be generally adopted. For the public services it is in our opinion unfair to the candidates and detrimental to the services themselves that the examinations should take place under unsatisfactory, and often hurriedly improvised, conditions. The testing of visual capacity is now an essential part of the physical examination of candidates for a large number of the public services, such as the Navy, the Army, the Mercantile Marine, the Indian Civil Service, and so on. We are of opinion that these tests should be conducted under approved conditions, and that this object would be best attained if the examinations were held at properly equipped centres.

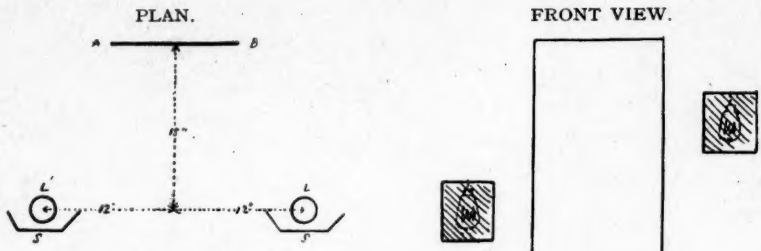
We fully recognize that variations of visual acuity arise from many causes other than the actual illumination of the test types, such as the condition of retinal adaptation, contrast between the test object and its background, the size of the pupil, lateral illumination, and so on. We think, however, that these effects can be minimized sufficiently for practical clinical purposes if the testing takes place in a moderately well illuminated room, with the test types efficiently lighted, and with the careful elimination of any glaring lights or bright objects from the candidate's field of vision.

We consider that the requirements are sufficiently well-satisfied by the following means:

*One foot candle is the illumination received from a source of one candle power falling perpendicularly on a surface at a distance of one foot from the source.

Two ordinary 20 watt tungsten lamps with straight filaments are fixed vertically 15 inches in front of the plane of the test card, one on each side, at a horizontal distance of 12 inches from the vertical plane normal to and bisecting the card. One lamp is placed higher than the other, one being opposite the junction of the upper and middle thirds of the card, the other opposite the junction of the middle and lower thirds. Opaque non-reflecting screens are fitted, so as to prevent direct light from the lamps reaching the candidate's eyes.

The accompanying diagrams illustrate the arrangement recommended.



A, B. = Test card.
L″, L²= Lamps.
S, S. = Screens lined with matt black.

This method ensures:

(1) Sufficient illumination. With new lamps the illumination on the test types will be of the order of 10 foot candles. The ordinary variations of current, deterioration of lamps, and the darkening of the test card with age will not reduce the brightness of the test card so illuminated to a value less than that of a perfectly white surface receiving an illumination of 3 foot candles.

(2) Sufficient uniformity of illumination. Whilst we are aware that the same result can be achieved by the employment of properly designed and carefully placed reflectors we have had to recognize in making these proposals that the testing of visual acuity must often be carried out in circumstances which do not admit of the use of special lighting arrangements, requiring technical skill in their installation or upkeep. We have, therefore, endeavoured to prescribe a method of ensuring the necessary illumination which is simple to erect, is not liable to become deranged by subsequent treatment, and which enables ordinary lamps on the market to be employed.

Where electric light is not available a similar arrangement can be installed, using other illuminants (*see* appendix).

Daylight Illumination.—There is no theoretical objection to the

use of diffuse daylight so long as the illumination on the test types is adequate, i.e., does not fall below 3 foot candles. In cases of doubt, it would be necessary to apply tests requiring the skilled use of some form of photometer. We are therefore of opinion that, in order to secure uniformity and comparable results, artificial illumination should in general be used, and invariably in testing for the public services.

We therefore make the following recommendations:

I. *The Test Types.*—The test types shall be of the dimensions laid down by Snellen, and printed on a matt white surface.

II. *Illumination.*—

a. The minimum illumination on the test card shall be such that its brightness shall be equivalent to that of a new card illuminated to at least 3 foot candles;

b. The illumination of the test types shall be as uniform as possible;

c. Artificial illumination shall be used in preference to daylight;

d. The testing room shall be moderately illuminated, and care shall be taken that there are no glaring lights or bright objects in the candidate's field of vision;

e. Extreme contrast between the illuminated test card and the background shall be avoided.

III. *Method of Lighting.*—

a. The method of lighting described in this report shall be in general adopted;

b. This method shall be made compulsory for sight testing in all public services.

Appendix.—Illumination of Test Types by Gas or Oil Lamps

Gas Lighting.—Two " medium " inverted incandescent burners, consuming $2\frac{1}{2}$—$2\frac{3}{4}$ cub. ft. of gas per hour, are fixed $2\frac{1}{2}$ ft. in front of the test card, one on each side, at a horizontal distance of 12 inches from the vertical plane, normal to and bisecting the card. One burner should be higher than the other, one being opposite the junction of the upper and middle thirds of the card, the other opposite the junction of the middle and lower thirds. Burners should be equipped with clear glass globes, and care should be taken to ensure, by regular maintenance, that mantles and burners are kept in good order and in clean condition. Opaque non-reflecting screens are fitted, so as to prevent direct light from the burners reaching the candidate's eyes.

Oil Lighting.—Two standard " Duplex " oil lamps, each having a double straight wick, 1 inch in width, and a chimney $10\frac{1}{2}$ inches in length, are fixed 2 ft. in front of the test card, one on each side, at

a horizontal distance of 12 inches from the vertical plane, normal to and bisecting the card. One lamp should be higher than the other; one being opposite the junction of the upper and middle thirds of the card, the other opposite the junction of the middle and lower thirds. The wick should be turned up as high as is possible without smoking, and the face of the wick should be turned towards the card. The distance from top of wick to level of oil in reservoir should not exceed 5 inches. The lamp should be lighted 20 minutes before the test, so as to ensure steady conditions of burning. Opaque non-reflecting screens are fitted, so as to prevent direct light from the lamps reaching the candidate's eyes.

ANNOTATION

Standard Illumination of Distant Tests of Vision

The desirability of securing fair and equal conditions in the visual examination of all candidates for public services is obvious. That these examinations are sometimes carried out under unsatisfactory and often hurriedly improvised arrangements is unfair to the men examined and detrimental to the services themselves. Under the present regulations for most of the services the examination is supposed to take place in daylight, and in this country at least no more variable factor could be introduced. We are glad to note that one of the first duties undertaken by the Council of British Ophthalmologists has been to investigate this question and to set up a standard of illumination which, if generally adopted, will secure equal and fair treatment for all candidates for public services. The report of the Council which we publish in this number has been drawn up by a strong committee, consisting of Sir George Berry, Sir Richard Glazebrook, C.B., F.R.S., Director of the National Physical Laboratory, Mr. C. C. Paterson, O.B.E., also of the National Physical Laboratory, Mr. Leon Gaster, Secretary of the Society of Illuminating Engineers, Mr. J. Herbert Fisher, Col. J. Herbert Parsons, Mr. A. B. Cridland, and Mr. W. H. McMullen, O.B.E. The aim of the committee has been to secure that under no circumstances shall the illumination falling on the test types go below a standard of three foot candles. Above this minimum there is a very considerable range in which very little change in visual acuity takes place. With the arrangements suggested an illumination of ten foot candles is secured on the test types. They find that this is sufficiently above the minimum to allow for all ordinary causes of deterioration, such as variations in the current, age of lamps, and darkening of the test card. Opaque screens are used

to prevent the direct light from the lamps reaching the candidate's eyes, but these are made with matt black non-reflecting surfaces. In this way uniformity of illumination is secured on the card and avoidance of failing illumination through dirt or deterioration of a reflecting surface. The card itself should be matt white (not varnished) and the testing room moderately illuminated in such a way that no glaring lights or bright objects come in the candidate's field of vision.

These objects can all be secured at very small cost, and they represent the minimum which should be aimed at in fairness to all candidates. But we strongly endorse the dictum of the Council as to the desirability of all such examinations being held at properly equipped centres. Every ophthalmic surgeon has during the last four-and-a-half years had experience of the difficulties of examining men and making decisions under adverse circumstances and with equipment quite inadequate for the purpose. We know of a case where an ophthalmic surgeon worked for eighteen months, and examined hundreds of men, in a draughty corridor with confusing cross lights, and amidst the constant noise of passing trollies. Dare we hope that when ultimately the dream of a Ministry of Health is realized, one of its early tasks will be to institute a properly equipped centre for the full medical examination of all candidates for the public services?

We heartily congratulate the Council of British Ophthalmologists on its first published report, and hope that its recommendations will receive general acceptance.

ABSTRACTS

I.—METASTATIC OPHTHALMITIS

(1) **Pichler (Klagenfurt). — Sudden paresis of the pupil as the first sign of a metastatic ophthalmia. (Plötzliche Pupillenlähmung als erstes Zeichen einer metastatischen Ophthalmie.)** *Klin. Monatsbl. f. Augenheilk.*, June, 1915, p. 682.

(1) **Pichler** noted in one case of pneumonia, in one of pyaemia, and in one of meningitis and pneumonia, that the pupil of one eye suddenly became dilated and did not contract to light. Either at the same time, or within two or three days, metastatic ophthalmia was found to be present. All the cases were fatal.

H. M. TRAQUAIR.

(2) **Szily, A. von.—Metastatic ophthalmia following war injuries.** *Atlas der Kriegsaugenheilkunde*, Stuttgart, 1916.

(2) In this book **Szily** devotes a chapter to metastatic ophthalmia, following war injuries, and gives full clinical and pathological details of four cases. The condition is rare. Not a single instance has occurred at the 2nd London General Hospital during the four years of the war, although a very large number of surgical cases have been treated there. Szily's cases, therefore, are of interest.

CASE I.—G. J. J., aged 29. Wounded, August 15, 1914, by a rifle bullet which entered behind the right ear, penetrated the mouth, and destroyed the superior maxilla, not injuring the eyes either directly or indirectly. There was also a severe wound of the buttock. When seen by Szily, September 12, 1914, there was exophthalmos of the right eye with chemosis, haziness of the aqueous, iritis, and a grey fundus reflex. The left eye also was affected, but to a lesser degree. On September 21, 1914, panophthalmitis was fully established, and the patient died September 25, 1914. Pneumococci were recovered from the vitreous, and also from cultures.

Post-mortem examination.—Pneumonia, pleurisy, pericarditis, septic infarcts in the kidneys and spleen. The eyes were examined, and showed evidence of septic inflammation, with the presence of the pneumococcus in all the structures.

Three to four weeks elapsed between the dates of the infliction of the wound and the involvement of the eyes.

CASE II.—B. M., aged 32, wounded August 24, 1914, by shell-casing in the left side of the neck. Operated on November 3, 1914, for a carotid aneurism. Subsequently he had attacks of raised temperature, and the wound was reopened January 18, 1915. In February, 1915, an attempt was made to remove the metal which was wedged in the cervical vertebrae, but unsuccessfully. March 12, 1915, left eye shows signs of inflammation. Exophthalmos, chemosis ; later on, iritis and panophthalmitis. Enucleation performed March 24, 1915, streptococci being recovered from the vitreous. The right eye was not involved. Pathological examination showed the eye to be a myopic one; complete detachment of the retina with inflammation of the whole of the retina, choroid, ciliary body, etc. Between the date of the wound and the onset of the panophthalmitis a period of nearly eight months elapsed, but there was only one month between the last operation and the inflammatory onset in the eye.

CASE III.—A. R., aged 24, wounded June 24, 1916, by a piece of shell casing in the right thigh. June 26, 1916, wound attacked by gas gangrene and amputation resorted to. Subsequently the patient developed a general pyaemia. July 7, 1916, the sight of the left eye became involved and the case was seen by Szily who diagnosed

metastatic ophthalmia and removed the eye July 15, 1916. Staphylococci were recovered from the patient's blood and also from the vitreous. Patient died November 15, 1916.

Post-mortem examination—Purulent metastatic lobular pneumonia of the left lung was found, also septic endocarditis. The eyes showed general septic inflammation of all the tissues and Gram-positive cocci were found in the retina. Two weeks only elapsed between the date of the wound and the onset of panophthalmitis.

CASE IV.—Qu. St., aged 25, wounded June 29, 1916, by an artillery shot in the lower extremity. June 30, 1916, two wounds (*a*) just below the knee in the soft parts, (*b*) compound fracture of the tibia just above the ankle joint. Temperature raised, headache, etc. Leg was put up in a plaster of Paris bandage. July 23, 1916, inflammation of left eye. Ciliary injection, aqueous hazy, iritis. July 25, 1916, L. E. removed on account of panophthalmitis. Typical chain cocci found in the vitreous. July 27, 1916, patient died.

Post-mortem examination.—Cellulitis of the leg, with septic thrombosis of the femoral vein. Metastatic abscesses in the neck, rectus muscle, epididymis, etc., endocarditis.

Szily from his examination of these cases comes to the conclusion that in the first three cases the eyes were infected through the retinal vessels and the last through the ciliary vessels of the iris and ciliary body. From the pathological standpoint the cases are dealt with fully.

ARTHUR W. ORMOND.

(3) **Coriat and Boulat.—A case of bilateral metastatic ophthalmitis consecutive to war wounds. (Un cas d'ophtalmie métastatique bilatérale, consécutive à une blessure de guerre.)** *Arch. d'Ophtal.*, May-June, 1918.

(3) Metastatic ophthalmitis attacking both eyes is sufficiently uncommon to justify the record of individual examples. The case under the care of **Coriat** and **Boulat** is reported with full clinical details, including the temperature chart, and will repay study by those interested. The chief features of the case are as follows:

The patient, a soldier, aged 29, was wounded by shell fragments on September 26, 1916, and admitted to hospital on September 29. He had a deeply penetrating wound in the left sacro-iliac region, with a fragment of shell embedded close to the sacro-iliac symphysis, and a second but superficial wound of the right thigh. The latter wound healed readily; the former was suppurating, but not severely and the patient was able to walk about comfortably. On December 18, the fragment of shell was extracted through a large incision, with removal of some bone. This was followed next day by severe pain in the left leg, along the sciatic nerve, and a

sharp rise of temperature. The wound on the fifth day was healthy and there was very little pus. On December 26, the man complained of severe pains in several joints, especially on movement. On January 12, slight conjunctival congestion of the right eye was noted. On January 13, there were dilatation and immobility of the left pupil, and dimness of vision; the general condition of the patient had become much worse, although a free escape of pus from a cavity at the bottom of the wound had occurred.

From this date signs of acute ophthalmitis rapidly developed in both eyes, and ultimately perforation of both corneae occurred. The patient died on January 26. Unfortunately no autopsy was made.

In this case, as in nearly all similar observations hitherto published, the ophthalmitis may be considered as the manifestation of an infection of long duration. Chenet, in his interesting thesis on this subject, has shown that metastatic ophthalmitis usually occurs in the course of *chronic* suppuration, in which septicaemia is slowly established. In the 46 cases collected by him, the date of appearance of ocular signs varied from one to forty days. In the case now reported the first signs of ocular involvement were noted 3½ months after the wound, and at a time when the multiple joint lesions testified to the spread of pathogenic germs in the circulation.

A noteworthy point in this case is the rapid increase in severity of the symptoms from the time at which the eyes become involved. Before the eyes were attacked the patient seemed to strive with more or less success against infection; as soon as ocular infection occurred, resistance weakened and the disease made rapid progress. It would seem, as Chenet has said, that "ophthalmitis is a true sign of the defeat of the human organism, which has been maintaining for a long period a struggle against invasion by pyogenic microbes, derived from the infected wound."

The prognosis in metastatic ophthalmitis is grave and especially so in cases which are bilateral. Chenet's thesis contains twenty-two examples of bilateral ophthalmitis all of which terminated fatally; death occurred from the first to the fourteenth day after the onset of the ocular lesions. Coriat and Boulat's patient died fourteen days after the first ocular manifestations.

J. B. LAWFORD.

II.—OPERATIONS

Keratoplasty

(1) **Magitot, A. (Paris).—A critical study of certain biological properties of the corneal tissue and of human keratoplasty. (Etude critique sur certaines propriétés biologiques du tissue cornéen et sur la kératoplastie humaine.)** *Ann. d'Ocul.*, September and October, 1916.

(1) **Magitot** has a suggestive article dealing with the bearing of the biological properties of the corneal tissue upon the success or failure of the operation of keratoplasty. It should be read in the original, since it is difficult to do justice to its contents even in a lengthened abstract, such as follows.

Anatomy

From the present point of view, the cornea presents two main anatomical elements, namely, the epithelium and the parenchyma. In discussing the peculiarities of these two parts, Magitot brings out no particularly new facts. He points out, however, that elastic fibres, which are derived from the fixed corneal cells, are present only towards the periphery of the cornea, in front of Descemet's membrane. Again, he insists that the cornea is particularly tolerant in certain directions, as, for example, towards some inert foreign bodies. Following the idea of Pellier de Quengsy (1789), many have covered leucomatous corneae with prothetic appliances. The tolerance of these contrivances seldom exceeds a few weeks, although there are exceptions to that statement. Thus, Salzer, employing small fixative hooks of gold, succeeded in keeping in place a crystal cornea for two and a half years in one case and for eight months in another. The same author, after superficial keratectomy, grafted a piece of horse's cornea, killed by immersion in formol. Without actually assimilating the foreign body, the cornea supported it so well that Salzer wished to compare the result with that obtained from living grafts.

The Regeneration of Corneal Tissue

In order to understand the different problems presented by keratoplasty, it is necessary to know how the corneal tissue repairs itself.

We must distinguish between the repair of (*a*) an aseptic wound, and (*b*) a wound caused by an inflammatory lesion.

(*a*) *Regeneration of the corneal tissues after the infliction of an aseptic wound* takes place as follows.—The lips of the divided

parenchyma show changes, as rarefaction of the lamellae, with the formation of lacunae, and swelling of the fixed cells, with fragmentation (Retterer). A wound of the parenchyma, then, leads to decay of the anatomical elements. The epithelium, on the contrary, manifests great activity. First, there is a sinking in of the elements along the edges of the wound (Ranvier). which represents an active movement, the result of which is the formation of new cells. It is not comparable with the sand gliding along the sides of a declivity. On the contrary, it results from an active movement, which starting at the limbus, is transmitted to the cells at the edges of the wound. After the second hour, in fact, one sees mitotic figures in the basal cells of the epithelium, a process that commences at the limbus.

The karyokinetic wave, so to speak, causes the marginal cells to fall into the wound. In this way they come to carpet the solution in continuity, more and more cells being pushed into the gap by successive waves originating from the limbus. The work proceeds so rapidly that Löwenstein has estimated that a loss of substance as considerable as 12 sq. mm. is covered in sixty hours. The cellular activity is accompanied by a dilatation of the vessels of the limbus, as well as by the appearance of small capillaries in the parts adjacent to the wound. The presence of these vessels appears to be indispensable, for if the sclero-corneal limbus be cauterized, the repair of a traumatism is much slackened. The single layer of flat epithelial cells augments in thickness, and as new elements are born from hour to hour, there is soon produced a supplementary layer and then another. The stratification resulting from this process has no tendency to cease until, by the accumulation of successive layers, the bottom of the wound is approximately brought to the normal low-water mark. In consequence of the proximity of the sclero-corneal vessels, the work proceeds more quickly towards the periphery than the centre of the cornea.

The wound is by these means covered with epithelium, but for several weeks there remains a depression, or *facette*, visible by focal illumination. In the course of five to six months, this disappears, little by little, by regeneration of the parenchyma. The origin of the fibroblasts (or keratoblasts) was believed by Ranvier to be from the fixed cells of the parenchyma, but Retterer is of the view that they originate mainly from the epithelium, and that the fixed cells play but a subordinate part. The conclusions reached by Retterer are based upon important observations made by Bonnefon and Lacoste, Salzer, and Magitot himself. In point of fact, the keratoblasts are to be found from the first in large numbers immediately beneath the epithelium and in contact with it. In many spots they may be found in the interval between the epithelial cells, or in the space between two detached epithelial layers. Magitot admits the epithelial origin of the keratoblasts (at least, until the contrary is

proved), and this he does apparently for two reasons.—1. At first the epithelial cells are the only ones to show exuberance and vitality, while the parenchyma surrounding the wound presents merely signs of degeneration. 2. The normal fixed cells, a little farther from the wound, remain inert, and are not capable of aiding in the regenerative process until much later.

(*b*) ***The regeneration of a septic wound of the cornea***, of which Magitot takes a pneumococcal ulcer as the type, opens up a different set of conditions for consideration. The corneal lesion is deprived of all epithelium. In the acute phase the microbic elements have their zone of activity, not in the bottom of the wound, but mainly at its edges.

The epithelial cells, then, have fallen before they have any chance of gliding into the depths of the wound. The usual phenomena of inflammation simultaneously make their appearance. The fixed cells of the parenchyma become transformed into macrophages. When the infection becomes extinct, the epithelium, little by little, recovers its activity, and gains the wound. The corneal lamellae, deeply dissociated by the leucocytic infiltration, have lost their rectilinear stratification, and have become thickened and wavy, while the gaps which separate them are filled with degenerate cytological elements. Above all, they have lost their primordial quality, transparency, and a leucoma is the result. As the outcome of several factors, the leucoma may improve.—First, the cellular débris lying between the lamellae may be slowly resorbed. Secondly, the newly-formed capillaries may disappear. Thirdly, there is a regeneration of transparent tissue, and this is less pronounced the deeper the ulcerative process, and vice versa. It is probable that the histological repair of corneal infections is not identical for each infection, while there are certainly differences as regards infections and burns, as by acid or by lime. The truth of this assertion is attested by the fact that a graft is better accepted by the latter than by the former. Magitot points out that: (1) the excision of a morsel of a leucoma leaving cicatricial tissue around, results only in the formation of a new opaque tissue; (2) if the leucoma be completely excised, transparent regeneration is possible, as in Malgaigne's case; and (3) if a leucomatous disc be transplanted into healthy tissue, it is found at the end of several months that the opacity of the graft has notably diminished.

The Grafts

A piece of healthy cornea taken from an animal and transplanted into the sound cornea of the other eye, retains its transparency and rapidly adheres, provided the operation has been carried out aseptically. The adhesion of the graft, which occurs in several hours, is chiefly due to the epithelium of the grafted eye. The

tissue of the parenchyma of the graft survives, but it appears that the fixed cells die. These cells are replaced immediately by others which result from the proliferation of the fixed cells of the grafted eye. At the end of several months, then, the graft is represented by its epithelium and by most of its tissue proper, in which may be found elements of new formation, derived from the grafted eye. If the graft be transplanted into the cornea of an animal of the same species as that from which it was taken, at first coalescence and transparency are observed, but the last-named is perhaps a little less perfect, although it tends to improve. The conditions are different when a corneal graft is transplanted into the eye of another species. Successful transplantation as between guinea-pig and rabbit has been carried out, but both are rodents belonging to the mammalia. On the other hand, as between the hen and the rabbit, the graft is merely tolerated and not assimilated. At the end of several weeks, the epithelium of the graft is absorbed by that of the host, and the tissue proper is completely destroyed and replaced by that of the host. With the foregoing data in mind, we may make the following classification.—(*a*) ***Autoplasty***, when the graft has been taken from the same individual; (*b*) ***homoplasty***, when the graft has been derived from an individual of the same species; and (*c*) ***heteroplasty***, when the graft has been taken from an individual of a different species. Many heteroplasties have been performed upon man, and all the domestic animals have been drawn upon for the purpose. Yet there has never been a lasting success. Magitot hints, however, that there may be a chance of success if anthropoids are employed. As regards man, autoplasty gives 95 per cent. and homoplasty about 60 per cent. of successes. The conditions are different in man and animals: in human beings one has to deal with an abnormal tissue, whereas in animals the cornea is normal.

Provided the wound is aseptic, the corneal tissue is capable of undergoing spontaneous transparent regeneration, as may be witnessed in certain traumatisms of the human cornea. It may be equally seen at the end of several months, after we have removed a flap of transparent tissue, but it is quite otherwise when dealing with a piece of leucomatous tissue. As pointed out before, in order to obtain a good result, we must remove entirely the cicatricial tissue under strict aseptic conditions. This view is borne out by experiments made by Magitot upon cases of pterygium where the cornea is invaded.

It is unfortunate that all leucomata are not capable of being equally benefited by the operation of keratoplasty. Pathological anatomy shows how different these cicatrices are. The reason is two-fold: first, the cause; and, secondly, the extent of the corneal disturbances. Of the numerous affections entailing the production of blemishes, infections occupy a predominating place. Those due

to the pneumococcus or Petit's bacillus give rise to ulcerations which, although having a variable extent, are circumscribed. The regions not actually invaded by the microbes retain, when inflammation has subsided, not only their transparency, but show little thickening of the parenchyma. It is otherwise in interstitial keratitis. The corneal lamellae remain dissociated and infiltrated with cells of new formation and lymphocytes. At the level of the leucoma the cornea is doubled or tripled in thickness. From what we know of the *treponema*, it is probable that some of these microorganisms remain in the tissue, which explains the fact that attempts to transplant sound tissue have provoked renewed inflammation. Another affection in which the results are disappointing is pemphigus. On the other hand, keratoplasty may be expected to give its full effect in the cicatrices left by ulcers and superficial burns and in pterygium.

Another important condition is the extent and particularly the depth of the cicatrix. If it does not extend to the membrane of Descemet, the result of keratoplasty is likely to be good as regards transparency. If the contrary is the case, total keratoplasty alone remains, and that operation is still in its infancy and bristles with difficulties. It is clearly important, therefore, to be able to gauge the depth of the scar. There is, however, only one certain way of doing this, viz., by operation.

The Elements of Success and of Failure

Magitot next discusses the elements of success and failure in keratoplasty. In the first rank he places the question of soil *(terrain)*, and then he mentions the several points of the extent and the depth of the leucoma and of its origin. The choice of graft is also important. The best chances lie in autoplasty. If the periphery of the leucomatous cornea is healthy, the flap should be taken from that eye, and the best place is the zone covered by the upper eyelid. Under other circumstances, it may be necessary to take the graft from the other eye, but, in principle, if that eye is quite sound, it is better not to touch it, and to get the graft from another person, although the chances of success are diminished by doing so. The graft should not be thick. The reason for this lies in the fact that the tissue proper of the cornea swells in taking up water. It is impossible to prevent this from taking place, for despite all care, we cannot hinder the tears from coming into contact with it. Even during the dissection, the graft has already doubled in thickness. It follows that, however quickly it is placed in position, the graft projects from the general plane of the cornea. It has no tendency to settle down until several days have passed, and meanwhile there is always the risk of displacement. In short, the piece of tissue transplanted should be slenderer than the portion of

leucoma excised. Another reason why the graft should be thin is that the only parts of service are the epithelium and the lamellae lying immediately beneath. In order to avoid perforation of the anterior chamber, it is well to be provided with two or three special instruments. Magitot does not approve Hippel's trephine for cutting the flap, but prefers trephines after the Bowman type, having a diameter of 4mm. or 5 mm. He detaches the graft by a special instrument, of which the blade is set at an angle of 45 degrees with the handle. The utmost care must be taken not to displace the graft while removing the speculum from the eye.

As to the causes of failure in keratoplasty, Magitot lays stress upon opening of the anterior chamber during the operation. Should this accident take place, the lips of the corneal parenchyma become swollen by imbibition of aqueous humour, which prevents coalescence of the graft and is only too likely to lead to detachment of the same. The most rigid asepsis is, of course, necessary. Asepsis of the conjunctival culs-de-sac is to be secured by employing repeated eye baths of serum, and, finally, by mechanically cleansing the conjunctiva with Locke's formula,* without glucose, or in default of that liquid, with serum, employing a curved and flat canula for the purpose. In order to avoid injury, the graft should be touched as little as possible. As regards anaesthesia, Magitot uses a 2 per cent. solution of cocain, and does not exceed that strength. The eye that has been operated on is covered with a warm moist dressing and cotton wool. The binocular bandage is left alone for forty-eight hours, and the eye is then bathed with serum. On the third day the binocular is replaced by a monocular dressing. This is replaced by dark glasses on the sixth day. For the first four or five days the graft is slightly prominent, but this convexity disappears in about a fortnight.

The Operation itself and its Accidents

Magitot next enters into a minute description of (*a*) partial keratoplasty, (*b*) transcorneal keratoplasty, and (c) total keratoplasty. It seems unnecessary to follow him into these descriptions, although a word may be said as to certain incidents that may attend the operations.

In partial keratoplasty the anterior chamber may be opened, usually during dissection of the leucoma. The wound may be trivial, in which case the aqueous will escape drop by drop, moistening the flap and determining its swelling by imbibition. Under these circumstances, as also when the aqueous escapes with a gush, the

*Locke's artificial serum contains: sodium chloride, 1 gm.; potassium chloride, 0·01 gm.; calcium chloride, 0·02 gm.; sodium bicarbonate, 0·02 gm.; glucose, 0·1 gm.; and water, 100 cc.—"The Extra Pharmacopoeia," Vol. II, p. 310, 1915.

operation should be interrupted for a month. On the other hand, the surgeon, desirous of avoiding evacuation of the aqueous humour, may cleave the cornea in such a way as to remove but an insignificant thickness of the leucoma. If the mistake is observed at the beginning, there is nothing to prevent the point of the needle from being withdrawn and introduced at a neighbouring spot. On the contrary, if the fault is not noticed until after part of the flap has been dissected, the best plan is to liberate the flap in three-fourths of its circumference, to seize it with small forceps, to turn it over, and to continue the slitting (*clivage*) in a deeper plane. By exerting too great pressure with the fixation forceps, the graft may be torn during dissection, and of this, supposing the graft to heal, traces will be visible for months. When the flap has been placed in the cavity prepared for its reception, it may become displaced by movements of the eyelid. It should be replaced at once. In order to avoid this accident, the speculum should be removed with care, and the patient be advised to close the eye gently, as in sleep.

Conclusion

The last nine pages of Magitot's communication are devoted to a discussion of the whole question. A healthy cornea is capable of transparent repair, provided the wound has not become infected. Even a large excision of corneal tissue from man may be repaired without leucoma. In about a year, the resulting *facette* is almost unrecognizable, while the irregular astigmatism has markedly diminished. The amount of repair naturally varies with the extent and the depth of the loss of substance. Magitot noted that it took seven to nine months to render imperceptible a trephine aperture in the thickness of the periphery of the cornea, 4 mm. in diameter and five- to six-tenths of a millimetre in thickness. The nervous sensibility of the affected area probably never returns quite to normal.

In the matter of pathological tissue, the difficulties are greater. Laboratory animals are but little susceptible to the microbic elements to which the human cornea is so sensitive. The infections set up experimentally either exceed their end or else are extremely fugacious. Burns entail indelible scars in men, but in animals (when the eyes are not wholly destroyed), after a period of suppuration, a transparent repair of the parenchyma takes place. In man, the aseptic excision of a morsel of a leucoma provokes considerable vascularization and ends in the production of a more opaque cicatrix. To that rule there are, however, important exceptions. For example, certain scars resulting from superficial burns may become regenerated in a transparent manner, even if the trephine does not include the whole of the cicatricial tissue. The tissue, however, must not be too dense, and, above all, too profound. In a word, it seems that

regeneration is possible only if in the depths of the wound, the instrument has bitten into healthy parenchyma. The leucomata which result from ulcers can be ablated with advantage only if the whole of the cicatricial tissue be removed, both as regards extent and depth. Clinical experience shows us, in fact, that in this respect there is a great difference between this kind of cicatrix and that which results from burns.

In considering the grafts, we must take account of three different questions: the operative technique, the material of the graft, and the soil. Partial keratoplasty is regarded as uniting the minimum of inconveniences, while transcorneal keratoplasty is looked upon as exposing the patient to all the dangers of a penetrating wound of the eyeball. That is the current view. But by perfecting the technique of the last-named operation it has been found that it can be performed with a minimum of danger. The errors of appreciation as between the results of the two operations arise from the material transplanted and the nature of the soil. It is agreed that the best chances of success are given by the autoplastic plan, whereas with homoplasty the percentage of happy cases falls rapidly. In man, heteroplasty has so far furnished nothing beyond numerous failures. The fate of the graft is still a controversial point. Does the graft ultimately disappear, being replaced little by little by new tissue from the cornea, or is it able, on the contrary, to survive on its own account, merely borrowing from the surrounding tissue nutritive materials? In considering this question, we must first remember that the normal cornea is remarkably tolerant towards aseptic foreign bodies, and particularly towards organic foreign bodies. A piece of dead cornea, fixed by protoplasmic coagulation with the aid of formol, may be borne without reaction for several years (Salzer), although finally it is eliminated. The author himself believes that an autoplastic corneal graft is almost always accepted. The nature of the soil destined to receive the transplant is of the first importance. The leucomatous tissues of men are not alike among themselves, owing partly to their diverse causes and partly to their extent and depth. It is unfortunately true that in man an autoplastic graft plunged in the midst of a cicatrix following an ulcer does not retain its transparency beyond a few days. Burns occupy a place apart.

In conclusion, the author tells us that he has performed keratoplasty about forty times, almost always partial keratoplasty. The results have almost invariably been excellent in leucomata determined by burns, and almost invariably unfavourable when the cicatricial tissue has resulted from ulceration. In fact, the only two cases where a good result was obtained in the last-named class were in patients in whom transplantation was carried out after complete resection of the corneal scar. As matters stand, burns, pterygia

(simple or cicatricial), and trachomatous leucomata may be benefited by the operation. It is possible that in the future this list may be considerably extended. Magitot lays stress upon the advisability of employing very thin grafts. The ideal would be the purely epidermic graft proposed by Bonnefon and Lacoste. As, however, a Thiersch's corneal graft is not easily to be obtained, we must in the meanwhile be content with one of minimum thickness. The last word has yet to be spoken on the subject of grafts. S. S.

(2) **Walker, Sydney, junr. (Chicago).— Present status of corneal transplantation and some experimental data.** *Ophthal. Record*, August, 1917.

(2) Summarizing his study of the literature of corneal transplantation, **Walker** concludes that foreign body transplants (glass, celluloid, and so forth) and heteroplasty are bound to lead to failure, and that autoplasty and homoplasty offer the greatest chance of success. By experimenting upon the eyes of dead dogs, Walker found it impossible in those animals to make corneal grafts with a conjunctival flap attached, as advocated by Lohlein. He accordingly decided upon a modified Thiersch graft, and applied the method to twelve living dogs. The eyes were treated for three weeks by the nightly instillation of protargol (3 per cent.) and by washing them out each morning with sublimate (1:4,000). Operation was not undertaken until a bacteriological examination showed that the conjunctival sac was free from virulent micro-organisms, particularly the streptococcus. Meanwhile the dogs were kept in fumigated cages.

The operation was performed as under.—The ocular conjunctiva was loosened up over the whole area extending from seven to four o'clock on the dial, so that it could be readily pulled over the entire cornea without much tension. After bleeding had been carefully stopped, the corneal flap was cut with a Graefe cataract knife, and three or four fine silk ligatures were passed through its corners, for which purpose the author designed special forceps. Meanwhile the host's cornea was prepared in the way described above, and the flap, moistened with normal salt solution, was laid upon the prepared cornea. The sutures attached to the graft were inserted just deep enough to hold, and when all were in place they were pulled taut, so as to approximate but not to strangulate the tissue. The threads were cut off close, and the eye was washed with normal salt solution. The conjunctival flap was next brought over the entire cornea and sutured. In dogs, the third eyelid was sutured over the flap and the lids were bandaged. Forty-eight hours after operation the conjunctival flap was loosened, and any remaining corneal sutures were taken away. Dionin (5 per cent.) and weak sublimate irrigations

were used. At this stage the corneal graft was clouded, and there was some injection, but the process tended to clear, and the final result was a leucoma discernible under strong light. After three or four months there was little to show how extensive the flap had been.

In three of the twelve experimental dogs, where the minimum amount of blood was allowed to remain when the conjunctival flap was brought over the cornea, the result appears to have been good. Four months after operation the eyes looked normal and the surface was absolutely smooth and regular.

Walker further operated upon three patients, whose cases are abstracted below:

(1) Female, 26 years, with dense leucomata covering central third of cornea in both eyes as the result of small-pox. Autoplasty upon one eye alone. The whole of the leucoma was not removed. On loosening the conjunctival flap on the second day, the graft was found to be attached only at its upper border, and was later brushed off by the upper eyelid.

(2) Male, aged 23 years, with slight opacity of the central region of the corneal surface. Homoplasty. At present time graft in place, and the slight cloudiness and organization appears to be gradually disappearing under atropin and dionin.

(3) Female, 19 years, slight opacity quarter cornea from phlyctenular ulcer. Autoplasty. The graft is at present in place, and "cloudliness and organization no more than expected at this time."

Most of Walker's earlier failures were due to sepsis and ill-developed technique where the anterior chamber was punctured. Later, opacities and organization were due mostly to too much blood in contact with the flap.

Conclusions

1. Heteroplasty and foreign body grafts offer very small chance of success, and should be discarded, according to the literature.

2. Autoplasty and homoplasty at the present time will terminate with fair results, depending on the technique of operation.

3. The modified Thiersch graft is a simple, satisfactory, and expedient manner of obtaining graft.

4. The conjunctival flap, as described, offers sufficient nutrition with the minimum cloudiness and organization, besides serving to hold the graft in position while union is taking place.

5. With properly selected cases this operation will give fair results.

S. S.

III.—INTERSTITIAL KERATITIS

Derby, George S. (Boston). — Interstitial keratitis, with special reference to the end-result. *Ophthal. Record*, November, 1917.

Derby's communication is based upon 96 cases of interstitial keratitis, in most of which the inflammation had terminated at least two years previously. In 94 of the cases both eyes had been affected. The total number of eyes examined therefore was 190. In 168 of 182 eyes, or 92·30 per cent., more or less opacity of the cornea could be made out under careful examination. In 171 of 186 eyes, or 92·93 per cent., vessels were found in the cornea after the pupil had been dilated and the parts examined with an ophthalmoscope and a strong convex lens. As bearing upon the view that these fine vessels seldom, if ever, disappear, as held by Fuchs, Hirschberg, Silex, Saemisch, Galezowski, and others, Derby mentions a case where they were found to be present 55 years after the original inflammation, and he recalls Baas's observation where, although absent clinically, they were found on histological examination.

Posterior synechiae were present in 62 of the eyes in Derby's series. His experience leads him to think that the involvement of the iris and ciliary body often bears little relationship to the severity of the corneal process. In 4 of the eyes included in Derby's series slight opacification of the lens was noted. In 2 eyes, vitreous opacities were found, but in 38 eyes it was impossible to make a satisfactory examination of the deeper structures of the eye. Of 148 eyes, 81, or 54·73 per cent., showed lesions of the choroid and retina, usually in the form of disseminated lesions in the equatorial region. The author does not doubt that in some so-called negative cases lesions lay anterior to the equatorial region. The examination was made with care, with dilated pupil, and particular attention was paid to the periphery of the fundus. It so happened that the eyes were examined in two groups. In the first the percentage was 54·3, and in the second 55. Derby believes that in the majority of cases the fundus lesions appear independently of the corneal process, and usually antedate the latter.

Of 161 eyes examined under a cycloplegic and with the proper correction, Vision was 10/10 in 32; 7/10 in 17; 5/10 in 18; 4/10 in 13; 3/10 in 25; 2/10 in 14; 1/10 in 17; and less than 1/10 in 25. In another table Derby gives the vision of the better eye in 80 cases. From this it appears that vision was 10/10 in 24 eyes; 7/10 in 9 eyes; 5/10 in 11 eyes; 4/10 in 5 eyes; 3/10 in 11 eyes; 2/10 in 9 eyes; 1/10 in 6 eyes; and less than 1/10 in

5 eyes. These figures show that 24 children would have the same chance educationally as the normal child; 25 more could study in the same classes as normal children, but would be handicapped in choosing an occupation; 20, or possibly 26, could be educated in defective eyesight classes, or, failing that, would have to be referred to institutions for the blind, as would the remaining 5.

The relation of interstitial keratitis to tuberculosis has never been definitely settled, and the views of authors differ markedly with regard to the point. Derby, after quoting some of these views, evidently thinks that while most cases are due to syphilis, some are due to tubercle or to other causes.

In respect of recurrences, Derby found positive evidence of recurrence in 14 of 37 cases, and in 3 more he thought that recurrence was probable.

Finally, Derby mentions a couple of cases where the treatment of hereditary syphilis in early life did not prevent the development of specific affections of the eye later. At the same time he expresses a strong conviction that such discouraging cases should not deter us from the energetic treatment of affected children. He closes with the following quotation from Igersheimer: "In the interest of the later career of patients with interstitial keratitis it is important to administer antisyphilitic treatment with the greatest energy, not only during the course of the ocular disease, but afterwards from time to time as long as the Wassermann reaction is positive." S. S.

CORRESPONDENCE

OPHTHALMIA NEONATORUM

To the Editor, THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIR,

In the current issue of the Journal there is a note on the establishment of a hospital for infants afflicted with ophthalmia neonatorum and their mothers by the Metropolitan Asylums Board; and ascribing the impetus that secured this new provision to the Report of the Departmental Committee on the Welfare of the Blind. So far as my information goes this is scarcely correct; rather the British Medical Association should have been credited with the successful action.

In June, 1917, the Council of the Metropolitan Branch of the Association appointed a deputation (Mrs. Scharlieb, Messrs. Treacher

Collins, Brewerton, and myself) to press upon the authorities the need for better provision in London for the treatment of these cases. The deputation was favourably received by the Metropolitan Asylums Board and the London County Council. The Local Government Board wrote that circumstances were not convenient for the reception of a deputation, but that the officials would be pleased if I would come to answer certain questions. I was informed that the Metropolitan Asylums Board was anxious to be allowed to undertake the work, but that there was a difficulty, owing to the terms of the Act of Parliament controlling the activities of that Board.

That the British Medical Association should have been the effective agent in securing this new provision for London, is in keeping with earlier action of the Association through its Special Committee, with which you, Mr. Editor, were so largely concerned.

I am, yours faithfully,

N. BISHOP HARMAN.

HARLEY STREET, W. 1,
November 16, 1918.

ATROPIN IN CATARACT EXTRACTION

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—À propos of Mr. Fisher's suggestion to instil atropin with the cocain just before making the incision in cataract extraction, more than twenty years ago, I, for a time, instilled a drop of atropin solution immediately after the operation, before bandaging, but abandoned the practice because of the frequency with which the pillars of the iris became entangled in the ends of the incision. I always do the combined operation. I never use atropin before the operation, fearing some dilatation of the pupil, and consequent difficulty of getting a neat coloboma, but wait till the wound is sealed before instilling atropin.

Yours, etc.,

F. ANTILL POCKLEY, M.D.

227, MACQUARIE ST.,
SYDNEY, N.S.W.,
August 13, 1918.

[Although this correspondence was closed some time ago we think it fair to print Dr. Pockley's letter, having regard to the fact that it has travelled from Australia. At the same time it scarcely touches Mr. Fisher's suggestion.—ED.]

BOOK NOTICES

The One-eyed Victims of War. Surgical and Plastic Prothesis. (Les Borgnes de la Guerre. Prothèse Chirurgicale et Plastique.) By Dr. G. VALOIS. Paris : Masson & Co., 1918.

Statistics already published show that the percentage of severe ocular wounds has been much higher in this war than in previous conflicts. One of the results has been the publication, especially by French surgeons, of a large number of papers dealing with wounds of the eye and orbit, particularly in reference to the attainment of satisfactory cosmetic results in cases in which the eyeball and often part of the orbital tissues have been destroyed.

The volume before us gives a comprehensive survey of the subject based upon the experience of Valois and his colleagues at the XIII Ophthalmic Centre, and of the surgeons at other centres. It contains much that is of interest, much that is of practical importance, and should prove a valuable help to those who are called upon to repair the damage caused by extensive wounds of the eye and orbit. It contains a number of coloured drawings which are really helpful, but the majority of the illustrations in the text are of little value.

After some remarks on "the ocular prothesis of war," in which the necessity for intelligent collaboration of the surgeon and the prothesist is emphasized, the author devotes a chapter of 56 pages to the consideration of the damaged orbit in all or nearly all the varied forms resulting from war wounds. Too much space would be required to epitomize ever so briefly this chapter; suffice it to say here that it is an excellent and detailed description of the surgical means adopted with a view of *maintaining or restoring an orbital cavity sufficient and suitable for an artificial eye. It deals with cases for immediate, secondary, and late interference. The author emphasizes the value of early operation, wherever possible, and recommends the employment of a provisional olive-shaped prothesis, made of polished vulcanite, round which cicatrization may proceed. The use of grafts, conjunctival, epidermal, and cutaneous, with and without pedicles, for the restoration of destroyed and distorted lids, or for enlarging or creating an orbital cavity, is dealt with at some length* and the technique is fully described.

Chapter 2 of 47 pages on "The support of the prothesis" is perhaps the most interesting as it deals with the methods, now rather numerous, of providing the best possible stump for the artificial eye.

The older operations (abscission, evisceration, Mules's operation, &c.) are described. Following these the more recent methods of grafting new tissue in the orbit are considered at greater length.

The war has given ample opportunity for a thorough trial of these procedures, and most of the French writers are well satisfied with the results obtained. These methods include the implantation of fat, or skin and fat, of a portion of costal cartilage and of a graft consisting of the posterior portion of the sclera. The employment of a graft of living cartilage has failed occasionally in consequence of the cavity not being completely aseptic. In such cases the use of inert cartilage is recommended; this consists of a portion of costal cartilage from a calf hardened for a week in 20 per cent. solution of formalin, and then placed in sterilized water, in which it remains until used. Hardening in formalin renders these grafts immune to attack by pyogenic organisms and phagocytes. The employment of a scleral graft when possible has much to recommend it; full details and diagrams of the technique of this procedure are given.

Chapter 3 deals very fully with the "Adaptation of the artificial eye." French surgeons and makers of artificial eyes have given much care and attention to this, and to a greater extent than obtains in this country they gain information as to the size and shape of the conjunctival cavity by the use of moulds. These are obtained by the employment of liquid paraffin which solidifies at body temperature. From the mould thus obtained a cast can be made and on this the artificial eye is modelled.

The fourth chapter headed "Prothèse postiche orbitopalpébrale" contains an account of various forms of prothesis for cases in which no cavity exists in which an artificial eye can be fitted. The technique (advocated by Coulomb) is somewhat complicated and tedious, but the cosmetic results judging by an illustration are fairly satisfactory.

In the last chapter Surgeon-Major Descloux gives an account of the arrangements and regulations concerning the provision of apparatus to mutilated soldiers, in force in the French Army. These regulations have been framed in a very liberal spirit.

J. B. LAWFORD.

Ocular Nystagmus. (Nistagmo ocular.) By DAMENO. Libreria Las Ciencias: Casa Editora de A. Guidi Buffarini, Cordoba, Buenos Ayres. 1917.

This book consists of the thesis presented by the author to the Faculty of Scientific Medicine in the National University of Buenos Ayres for the degree of M.D. The subject is comprehensively discussed under the following headings: Congenital Nystagmus, Nystagmus and Spasmus Nutans, Miners' Nystagmus, Secondary Nystagmus, Voluntary Nystagmus, Nystagmus in Diseases of the Nervous System, Myoclonic Nystagmus, Nystagmus in Cerebral Tumour Cases, Vestibular Nystagmus, and, finally, the pathology of

the condition. Where possible the author has illustrated his remarks by appending notes of cases, and under the heading of Miners' Nystagmus, the prognosis and treatment are shortly discussed. The whole forms an excellent summary of our present knowledge of the disease.

R. R. JAMES.

The Errors of Accommodation and Refraction of the Eye, and their Treatment. By ERNEST CLARKE, M.D., F.R.C.S. Fourth Edition. London: Baillière, Tindall & Cox. Price 6s. 1918.

We are glad to see that in this edition of his popular handbook, Mr. Ernest Clarke advocates the use of the electric ophthalmoscope. The modern pattern, with the Marple mirror and the battery in the handle, makes it an ideal instrument for the practice of direct ophthalmoscopy in all circumstances. The book contains as clear an account of the theory and practice of retinoscopy as we have seen anywhere, but the author considers that this is not such a delicate test for astigmatism as the ophthalmometer. As we were led to expect from his previous writings, there is an interesting chapter on eye strain. The section on Optics might have been somewhat extended. It is unfortunate that the usefulness of the diagrams, which are otherwise excellent, should have been impaired by indistinct lettering. Evidently the author himself has found some difficulty in this direction, as the description in the text does not at all times correspond with the diagrams. The book concludes with a chapter on the Vision Tests for the Services.

T. S. A. ORR.

OBITUARY

We regret to announce the death of Nottidge Charles Macnamara at his residence at Chorley Wood, Hertfordshire, on November 21, at the advanced age of 86 years. His name was widely known both in general surgery and in ophthalmology. After qualification in 1854, he became assistant surgeon in the Indian Medical Service, and two years later surgeon. He was appointed professor of ophthalmic surgery in Calcutta, and founded the Mayo Hospital in that city, of which he was the first surgeon-superintendent. He served in the Bengal Medical Service as surgeon-major on the staff in the Sounthal rebellion (1855-56) and of the Tirhout Volunteers in the Mutiny. Whilst in India he published "Diseases of the Eye," of which a fifth edition appeared in 1891, and "Lectures on Diseases of Bones and Joints," of which a third edition was published in 1887. From 1871 to 1873 he edited the *Indian Medical Gazette*. In 1874 Macnamara retired and came to London, where he was

appointed surgeon to and lecturer on clinical surgery at the Westminster Hospital and surgeon to the Royal Westminster Ophthalmic Hospital, and on his retirement from active work in 1897 was made consulting surgeon to both the institutions named. From 1885 to 1901 he was a member of the Council of the Royal College of Surgeons of England, vice-president in 1893 and 1896, and delivered the Bradshaw Lecture in 1896 and the Hunterian Oration in 1901. He was a member of several departmental committees, and took a prominent part in the work of the British Medical Association. Macnámara's dignified appearance and courteous manner will not be readily forgotten by those who knew him.

General sympathy will be extended to our colleague, Dr. H. H. Burnham, of Toronto, whose son, Staff-Major Sydney Smith Burnham, has been killed in action. A graduate of Toronto University, he went overseas in 1915, and two years later was awarded the D.S.O.

The death is announced of Paul Chavernac, the well known Marseilles ophthalmic surgeon, who was in charge of the French ophthalmological service at Salonica. For his distinguished services the French War Cross and the Serbian Cross had been bestowed upon our gallant colleague. Chavernac studied eye work at Montpellier under Professor Truc, and wrote upon the inspection of children's eyes, occupational eye accidents, and the ocular complications of malaria as met with in the Eastern Army.

NOTES

Appointments

SIR JOHN TWEEDY has been re-elected President of the Medical Defence Union.

Captain Frank A. Juler, R.A.M.C., has been appointed Assistant Surgeon to the Royal London Ophthalmic Hospital.

Dr. van der Hoeve, of Groningen, has been called to the Chair of Ophthalmology of the University of Leyden.

* * *

Foreign Decoration

THE President of the French Republic has conferred the Croix de Guerre upon Captain Alexander B. Cluckie, R.A.M.C., once house surgeon to the Royal London Ophthalmic Hospital, and formerly of Bath.

* * *

Middlemore Lecture, 1918

THE Middlemore Lecture was delivered by Mr. J. Jameson Evans on December 3, 1918, at the Birmingham and Midland Eye Hospital. The subject was "The Choroid."

* * *

An Irish Ophthalmological Society

AT a meeting in Dublin on November 8, after delivery of the Montgomery Lecture by Dr. Euphan Maxwell, an Irish Ophthalmological Society was established. The rules were drawn up and adopted, and the following officers were elected: President, Mr. A. W. Sandford (Cork); Council, Messrs. J. B. Story, L. Werner, J. A. Craig, H. C. Mooney, and F. H. Crawley; Hon. Secretary and Treasurer, Lieut.-Col. T. H. Delany, I.M.S. (retired), 29, Upper Fitzwilliam Street, Dublin. At the first meeting the chair was taken by Mr. J. A. Craig (Belfast), and Mr. Werner exhibited lantern slides of a case of cysticercus and Mr. Story charts of fields of vision in glaucoma. On the following day cases were shown at the Royal Victoria Eye and Ear Hospital.

* * *

Precautions against Ophthalmia Neonatorum

THE Ontario Board of Health has issued the following precautions to be taken against ophthalmia neonatorum:

Every physician in attendance at the birth of a child shall instil into the eyes of the baby a few drops of a 1 per cent. solution of nitrate of silver or a 40 per cent. solution of argyrol.

If within two weeks one or both eyes become reddened, inflamed, swollen, or show any discharge, every attendant is required to make a report in writing to the Medical Officer of Health, with circumstances of the case. Upon receiving the report the Medical Officer of Health is required to place the child under the care of a qualified physician, if this has not been done.

When the parents are unable to defray the cost of such attention, the Medical Officer of Health is required to provide the necessary treatment, the cost being charged to the municipality.

The local Boards of Health must notify the Provincial Board of Health of all such cases.

The nitrate of silver solution is supplied free to doctors by the Provincial Board of Health.